Regione Siciliana
Assessorato dei Beni Culturali e dell'Identità Siciliana
Dipartimento dei Beni Culturali e dell'Identità Siciliana

CSEI Catania
Centro Studi di Economia applicata all'Ingegneria

HIGHER EDUCATION FOR SUSTAINABLE Food Production

5th Joint Meeting of Agriculture-oriented PhD Programs UniCT, UniFg and UniUD

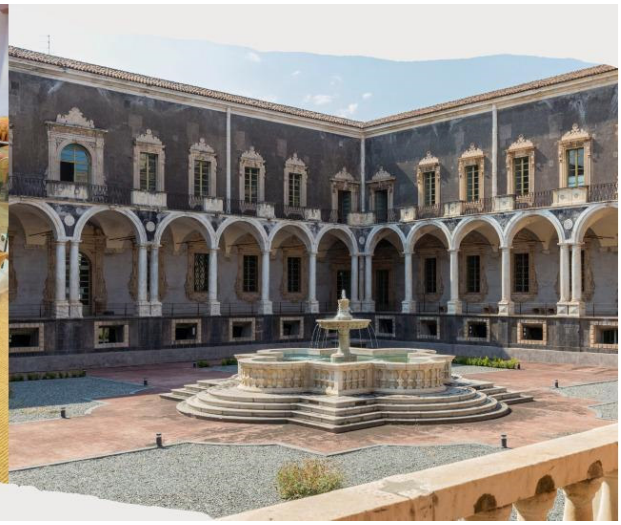
Catania, 25-28 September 2023

Program and Book of Abstracts

Università di Foggia
Università di Catania
UNIVERSITÀ DEGLI STUDI DI UDINE
hic sunt futura

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023



What is there to know about Catania?

Located in the southeastern part of Sicily along the Ionian Sea, Catania is rich in history, culture, and natural beauty. The city boasts a diverse architectural heritage given by the Greeks and later the Romans. An earthquake severely damaged Catania during 1693. Due to this fact it was rebuilt under the guidance of architect G.B. Vaccarini and his baroque influence remains visible in the city's historic center. The urban planning by Vaccarini turned the city into an "open-air theater," making it an ideal venue for various religious and folkloric events, including the Festival of St. Agatha, one of the world's largest Christian celebrations. The city is also naturally endowed, situated close to Etna Mount, which is Europe's tallest active volcano. The Catanese coast offers a contrasting panorama, from the golden beaches of the south to the black lava cliffs of the north. Catania is not just a feast for the eyes; it's also a gastronomic paradise! The city is famous for its rich culinary traditions, and visitors can explore vibrant markets such as "A' Piscaria" fish market and the "Fera 'O Luni" in Carlo Alberto's square for tasting local delicacies.

The best activities to do in Catania

- *Piazza del Duomo and the Chiesa di Sant'Agata - This is the main square of Catania and a must-visit. The Elephant Fountain "U Liotru" is a key landmark here.*
- *Il Castello Ursino - A historic castle built in the 13th century, now housing the Civic Museum and The San Berillo District (redeveloped) - This area has undergone a significant transformation and is now a trendy neighborhood worth exploring.*
- *Teatro Romano Odeon di Catania - An ancient Roman theater located in the heart of the city.*
- *La Pescheria and Fontana dell'Amenano - This is the bustling fish market of Catania, offering a real taste of local life and fresh seafood.*
- *Via Etnea - This is one of the main streets in Catania, lined with shops, cafes, and leading to the beautiful Villa Bellini.*
- *Piazza dell'Università - Another central square, surrounded by elegant buildings and hosting the University of Catania.*
- *Villa Bellini - A beautiful public garden that provides a peaceful escape from the urban hustle and bustle.*

- *Teatro Massimo Vincenzo Bellini in Catania - Named after the famous composer Vincenzo Bellini, this theater is a center for the performing arts in the city.*
- *Via Crociferi - This street is well-known for its churches and is considered one of the most beautiful streets in Catania.*
- *The Giovanni Verga House Museum in Catania - This museum is dedicated to the famed writer Giovanni Verga, offering insights into his life and works.*
- *The village of San Giovanni li Cuti - This charming small fishing village is a delightful place to visit for its quaint atmosphere and beautiful beach.*

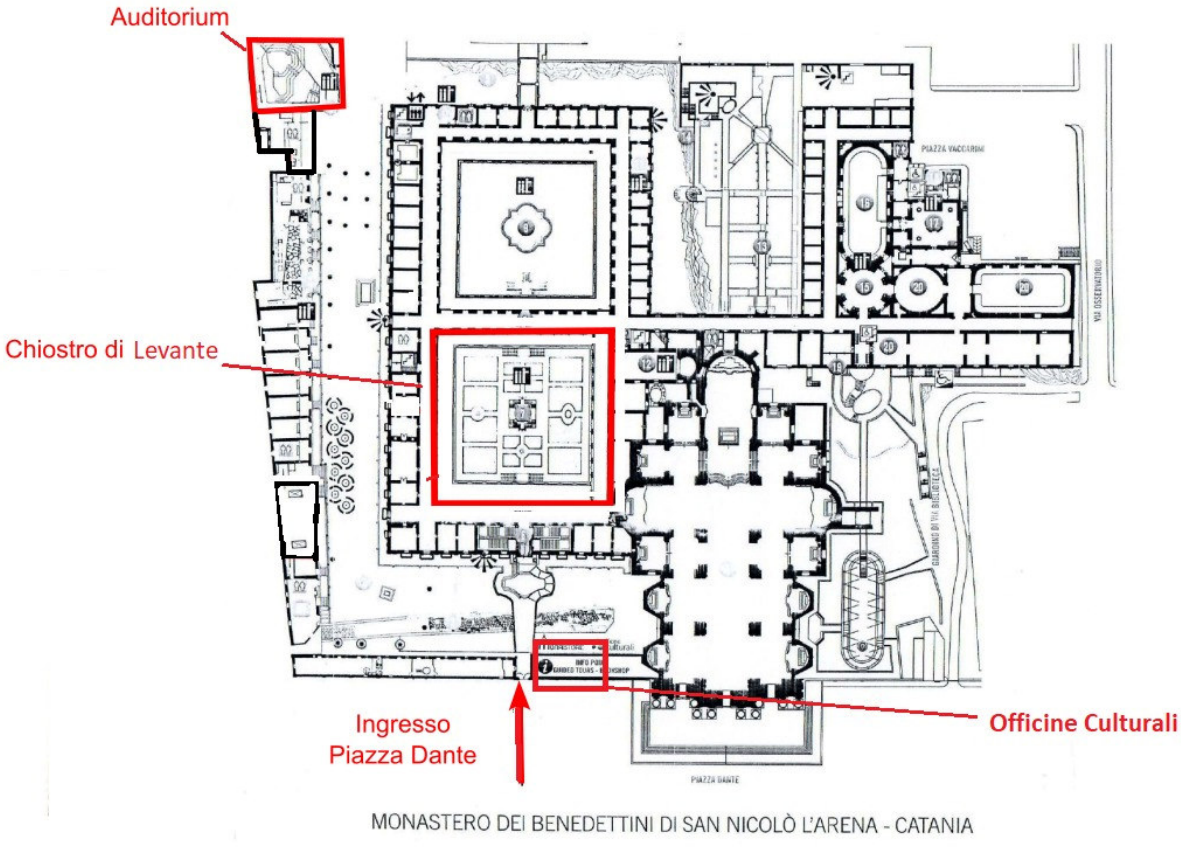
If you have time, the best things to do around Catania:

- *Acireale - Known for its Baroque churches and beautiful gardens.*
- *Aci Trezza - A fishers' village famous for its stunning cliffs and mythological history.*
- *La Valle dei Templi di Agrigento - A UNESCO World Heritage site, this is one of the most outstanding examples of Greater Greece art and architecture*
- *Siracusa and the Island of Ortigia - A beautiful city that was a powerful city-state in ancient times, featuring charming streets and beautiful sea views.*
- *Taormina - Known for its ancient theater and beautiful beaches, it's a must-visit for any traveler to Sicily.*

The History of Benedictine Monastery

Located just at a 10-minute walk from the Cathedral of Catania, the Monastery of San Nicolò l'Arena, also known as the Benedictine Monastery, is an extraordinary amalgamation of history, art, and architecture. Established in 1558, this late-Baroque jewel has exhibited remarkable resilience, surviving natural catastrophes such as the lava flow of 1669 and the devastating earthquake of 1693. Each disaster ushered in a phase of reconstruction and renewal, enabling the monastery to incorporate diverse architectural styles over the centuries. This Benedictine complex is not only one of the largest in Europe, but it is also recognized as a UNESCO World Heritage Site. Within its walls, the monastery boasts unique architectural features and natural spaces such as a stunning hanging garden. Moreover, the monastery serves as the home to the DiSUM (Department of Humanities) of the University of Catania and houses two Roman domus and various cloisters.

Map of the Benedictine Monastery



ORGANIZING SCIENTIFIC COMMITTEE

Maria Luisa Amodio (UniFG)

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Giancarlo Colelli (UniFG)

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Emanuela Rita Giuffrida (UniCT)

Francesco Nazzi (UniUD)

Alessandro Priolo (UniCT)

Lucia Russo (UniFG)

The authors of the abstracts are responsible for the content of their contributions

PROGRAMME AT A GLANCE – PART 1

	Monday, September 25, 2023	Tuesday, September 26, 2023
8:15 - 8:30	Registration opening at Auditorium De Carlo, Monastero dei Benedettini (Catania)	Bus departure from the Catania Downtown (Piazza Stesicoro Nord / Piazza della Borsa) at 8:30
8:30 - 9:00		
9:00 - 9:10	Istitutional Welcome Francesco Priolo, Rector of University of Catania, Claudio Bucolo, Deputy Rector of the University of Catania for Master and PhD studies	
9:10 - 9:20		
9:20 - 9:45	Opening Session Antonio Biondi, Coordinator of the PhD course at UniCT Francesco Nazzi, Coordinator of the PhD course at UniUD Maria Luisa Amodio, Coordinator of the PhD courses at UniFG	Transfer to "Rifugio Citelli", East side of Mount Etna, Sant'Alfio (CT)
9:45 - 10:00	1st Keynote Francesco Nazzi, University of Udine Some little things about research that I've learnt in the past thirty years	
10:00 - 10:30		
10:30 - 11:00	Morning session presentations 1-2	
11:00 - 11:30	Coffee Break	
11:30 - 13:00	Morning session presentations 3-8	Hiking Renzo Ientile - Biologist Giovanni Sturiale - Geologist CUTGANA, University of Catania Picnic Lunch (please bring your own)
13:00 - 14:00	Lunch break	
14:00 - 14:45	Afternoon session presentations 9-16	
14:45 - 15:15		
15:15 - 15:45		Transfer to "Tenuta San Michele", Cantine Murgo, Santa Venerina (CT)
15:45 - 16:00		
16:00 - 16:30	Coffee Break	
16:30 - 17:15	Afternoon session presentations 17-19	Murgo Wine experience
17:15 - 17:30	Summary of the day	2nd Keynote University of Udine Fabio Marroni Everything you wanted to know about grapewine genomics (but we afraid to ask)
17:30 -18:00	Visit to the Monastery of the Benedictines by Officine Culturali	
18:00-18:30		3th Keynote Rino Cirinnà Stories of Sicilian jazz musicians in the US JAZZ Concert - Cirinnà-duo, Piano and saxophone
18:30 - 19:30		
19:30 - 20:00		Tranfer to Catania Downtown
20:00 - 21:00		

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

PROGRAMME AT A GLANCE - PART2

	Wednsday, September 27, 2023	Thrusday, September 28, 2023
9:00 - 9:10	On-site poster installation	6th keynote Pilar De Frutos Consejo Superior de Investigaciones Científicas, Leon How ruminants learn to select nutritious diets and avoid intoxications
9:10 - 9:20		
9:20 - 9:45		
9:45 - 10:00	4th Keynote Ingunn Burud Norwegian University of Life Science Imaging in agriculture	Morning Session presentations 26-30
10:00 - 10:30		
10:30 - 11:00	1 year students Short presentation session poster 1-7	
11:00 - 11:30	Coffee break	Coffee break
11:30 - 13:00	1 year students Short presentation session poster 8-30	Morning Session presentations 31 - 37
13:00 - 14:00	Lunch break	Lunch break
14:00 - 14:45	5th Keynote Paolo Inglese, University of Palermo University Museum System: public engagement and cultural activities	7th Keynote Raimondo Riccardo, University of Catania How to write a successful Marie Skłodowska-Curie proposal
14:45 - 15:15	1 year students Short presentation session poster 31-37	
15:15 - 15:45	Afternoon session presentations 20-22	8th Keynote Giancarlo Colelli, Univeristy of Foggia The way I see bugs
15:45 - 16:00		Summary of the day
16:00 - 16:30	Coffee Break	Coffee Break
16:30 - 17:15	Afternoon session presentations 23-25	Closing section
17:15 - 17:30	Summary of the day	Walk to Piazza Università
17:30 -18:00	Poster Session I year students	Visit to Museo dei saperi e delle Mirabilia siciliane, Piazza Università, 2, Catania
18:00-18:30		
18:30 - 19:30		
19:30 - 20:00		
20:00 - 21:00		Social Dinner at Museo Diocesano, Piazza Duomo, Via Etnea, 12, Catania
21:00-23:00		

The Authors wish to thank the funders

Con il contributo della

Regione Siciliana
Assessorato dei beni culturali e dell'identità siciliana
Dipartimento dei Beni Culturali e dell'Identità Siciliana

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Uni ct AGRICOLTURA, ALIMENTAZIONE E AMBIENTE

Segreteria organizzativa

CSEI Catania
Centro Studi di Economia applicata all'Ingegneria

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

WORKSHOP SCHEDULE

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

MONDAY, SEPTEMBER 25

8:15 - 9:00 Registration opening
Auditorium De Carlo, Monastero dei Benedettini (Catania)

9:00 - 9:20 Institutional Welcome
Francesco Priolo, Rector of University of Catania,
Claudio Bucolo, Deputy Rector of the University of Catania for Master and PhD studies

9:20 - 9:45 Opening Session
Antonio Biondi (UniCT), Francesco Nazzi (UniUD) & Maria Luisa Amodio (UniFG), Coordinators of PhD courses

9:45 - 10:30 1st Keynote
Some little things about research that I've learned in the past thirty years
Francesco Nazzi, University of Udine

MORNING SESSION

Chairpersons: Negrini Ferreira Livia Maria & Maria Ester La Torre

10:30 – 10:45 *Presentation#1*
Selection of new *Ricinus communis* L: genotypes and improvement of the agronomic management in order to create a biorefinery in semi-arid Mediterranean environment
Valeria Cafaro, UniCT

10:45 – 11:00 *Presentation#2*
New technologies for the Ecological Transition in agriculture: nanomaterials, SIGS and plant phenotyping
Dora Scarpin, UniUD

11:00 – 11:30 Coffee Break

11:30 - 11-45 *Presentation#3*
Ochratoxin A and Aflatoxin B1-producing *Aspergillus* spp: in Italian nuts: Detection and evaluation of ozone as an alternative control strategy
Wanissa Mellikeche, UniFG

11:45 – 12:00 *Presentation#4*
Filling in the gaps: towards a deeper understanding of *Varroa destructor* longevity and reproduction under laboratory conditions
Silvia Parenzan, UniUD

12:00 – 12:15 *Presentation#5*
Antifungal activity of *Lactiplantibacillus plantarum* mediated by inducible VOCs
Nicola De Simone, UniFG

12:15 – 12:30 *Presentation#6*
Diversity of Botryosphaeriaceae species on Mediterranean and Tropical plants
Alberto Fiorenza, UniCT

12:30 – 12:45 *Presentation#7*
Experimental cheesemaking using plant-based milk-clotting enzyme and debittering adjunct culture
Domenico Fabrizio Nicosia, UniCT

12:45 - 13:00 *Presentation#8*
Development of molecular markers for sweet orange traceability
Sebastiano Seminara, UniCT

13:00 – 14:00 Lunch break

AFTERNOON SESSION

Chairpersons: Massimo Guazzini & Rudy Cignola & Aysha Saleem

14:00 – 14:15 *Presentation#9*
Identification and Characterization of Vitamin B2 overproducing LAB
Angela Scauro, UniFG

14:15 – 14:30 *Presentation#10*
In vitro tissue cultures from Coffea arabica: from callus to cell suspension
Azzurra Di Bonaventura, UniUD

14:30 – 14:45 *Presentation#11*
Morphological analyses and quantification of the cuticle in table grape berries
Paolo La Spada, UniCT

14:45 – 15:00 *Presentation#12*
INTEVINE: Multi-omics data integration to decode the interaction between soil and grapevine
Massimo Guazzini, UniUD

15:00 – 15:15 *Presentation#13*
Toxoplasma infection in goats in Pakistan: risk factors and public health significance
Muhammad Yaser Khan, UniFG

15:15 – 15:30 *Presentation#14*
Energy recovery from treatment wetlands biomass to enhance their sustainability in semi-arid climate conditions:
Liviana Sciuto, UniCT

15:30 – 15:45 *Presentation#15*
Physiological and production evaluation of different populations of Sicilian Wheat Landraces
Alessio Scandurra, UniCT

15:45 – 16:00 *Presentation#16*
Novel Plant Biostimulants to Improve Sustainability and Functional Traits of Pivotal Mediterranean Crops: Tomato and Carrot
Federico Basile, UniCT

16:00 - 16:30 Coffee Break

16:30– 16:45 *Presentation#17*
Variation of the Dog-Microbiome in Relation to Genetic and Environmental Factors
Fatemeh Balouei, UniUD

16:45 – 17:00 *Presentation#18*
Combined agronomic approaches to obtain Mediterranean vegetables with enhanced nutraceutical profiles:
Claudio Cannata, UniCT

17:00- 17:15 *Presentation#19*
Unlocking the physiology and molecular bases of phytoplasmas infection: an update
Fernando Cantão, UniUD

17:15 - 17:30 General conclusions of the day

17:30 – 19:30 Visit to the Monastery of Benedectines by Officine Culturali

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

TUESDAY, SEPTEMBER 26

08:15 – 8:30 Bus departure from Catania Downtown (Piazza Stesicoro Nord/Piazza della Borsa)

8:30 – 10:00 Transfer to "Rifugio Citelli", East side of Mount Etna, Sant'Alfio (CT)

10:00 - 13:00 Hiking with Renzo Ientile, Biologist and Giovanni Sturiale, Geologist, CUTGANA UniCT

Renzo Ientile is an expert in ornithology and evolutionary biology. He has worked with various Natural Reserves in Sicily and has contributed to national and international projects related to the conservation of birds and natural habitats. He will support us during the technical visit on Mount Etna.

Giovanni Sturiale has a background in geological sciences and is a professional geologist. He has been involved in various educational activities and has taught courses related to geology and geography at the University of Catania. Additionally, he has worked as a volcanological and naturalistic field guide and has experience in the management of excursion activities in natural environments.

13:00 - 14:00 Picnic Lunch (please bring your own)

15:15 - 16:00 Transfer to "Tenuta San Michele", Cantine Murgo, Santa Venerina (CT) –

16:00 – 19:30 Murgo Wine experience

Scamacca's Family - Cantine Murgo – The Tenuta Murgo is an agricultural company founded in 1981, located on the eastern slopes of Mount Etna, specializing in the production of Etna Doc wines: With a history that began in 1982 with their first Etna Rosso, the company now offers a variety of wine lines ranging from traditional to modern and creative. Their tastings, guided by expert oenologists, provide an immersive experience in the world of wine: Situated near the craters of Mount Etna, the company is an attraction for those looking to combine the discovery of wine with the natural beauty of the area.

2nd Keynote

Everything you wanted to know about grapevine genomics (but were afraid to ask)

Fabio Marroni - University of Udine

3rd Keynote:

Stories of Sicilian jazz musicians in the US –

Rino Cirinnà band - JAZZ Concert, piano, voice and saxophone

19:30 - 21:00 Transfer to Catania Downtown

WEDNESDAY, SEPTEMBER 27

9:00- 10:00 On - site poster installation

9:45 – 10:30 4th Keynote
Imaging in agriculture
Ingunn Burud, Norwegian University Life Science

1st YEAR SHORT PRESENTATION SESSION POSTER

Chairpersons: Antonio Biondi

10:30 – 11:00
Poster#1
Exposing Foggia's Hidden Habits: Wastewater-Based Epidemiology Sheds Light on Illicit Drug Consumption
Usman Muhammad, UniFG

Poster#2
Unlocking complexity: exploring genomes with third generation sequencing and T2T assemblies
Mario Liva, UniUD

Poster#3
Agronomic Strategies for Sustainable Cotton Production
Giuseppe Salvatore Vitale, UniCT

Poster#4
Technological strategies for food waste and loss valorisation through innovative food products design
Grazia Anna Pia Marinaro, UniFG

Poster#5
Exploitation of probiotic strains with targeting cholesterol reduction for the formulation of functional food
Agolino Gianluigi, UniCT

Poster#6

Up-cycling of Plastic Waste into Valuable Products through Microwave Assisted Co-Pyrolysis with Biochar from Residual Biomass

Tayyaba Gull, UniFG

Poster#7

Effect of nanoplastics on in vitro bovine granulosa cells culture

Susy Urli, UniUD

11:00 - 11:30 Coffee break

11:30 - 13:00

Poster#8

Microbial Biotechnologies for Sustainable Management of Food Products

Cunedioglu Hyula, UniFG

Poster#9

Epidemiological investigation of Shiga Toxin producing Escherichia Coli (STEC) in wild boars hunted in Apulia region

Fiorenza Petruzzi, UniFG

Poster#10

Promising legumes integration on milk production and welfare

Khan Suleman, UniFG

Poster#11

Exploring public acceptance of Nature-Based Solutions (NBS) in marginal areas through participatory methods: a view from the Simeto Valley inner areas in Italy

Emanuela Rita Giuffrida, UniCT

Poster#12

Insights into the genetic and epigenetic regulation of bud dormancy and deacclimation in grapevine

Fiamma Bunello, UniUD

Poster#13

Resilience to arid climate, nutritional benefits, and techniques for sustainable cultivation and multifunctional utilization of local genotypes of fruit species in marginal inner areas

Damiano Antoniciello, UniFG

Poster#14

Engage a New Generation of Good Farmers for Building a Resilient Agricultural System

Federica Consentino, UniCT

Poster#15

Comparison of Desalination Technologies and Assessment of Their Sustainability

Hiba Chebli, UniFG

Poster#16

Use of liquid nitrogen to preserve the antioxidant activity in pistachio skin

Fabiola Pesce, UniCT

Poster#17

Ecophysiological response of maize (*Zea mays*) to water stress: remote sensing and upscaling techniques for a more efficient management of water resources in agriculture

Giacomo Boscarol, UniUD

Poster#18

The regional ecological network and functional agroecosystem biodiversity: spatial strategies and nature-based solutions

Maurizio Gioiosa, UniFG

Poster#19

Evaluating the impact of Carbon dioxide and high temperature on *Sitophilus granarius* infestation in stored wheat grains

Asghar Ammara, UniFG

Poster#20

Territorial development of the SNAI area of "Calatino" and the role of the agri-food system

Giulio Cascone, UniCT

Poster#21

Environmental sustainability in dairy farms

Cristina Pavanello, UniUD

Poster#22

Strategies to overcome drought stress in Mediterranean environment: the case of ornamental plants

Leotta Luca Giovanni, UniCT

Poster#23

The role of Medium Chain Triglycerides (MCT) oil and Ketogenic Diet in Obesity and Inflammatory bowel diseases: in vitro and in vivo experiments

Maria De Stefano, UniFG

Poster#24

Sustainable valorization of sheep wool waste: new components for green buildings

Giusi Midolo, UniCT

Poster#25

A One-health approach: from feed to functionalized food

Isabella Pividori, UniUD

Poster#26

Identification and evaluation of the biological activity of semiochemicals for the monitoring and control of olive tree moth, *Prays oleae* (Bernard), and cotton bollworm, *Helicoverpa armigera* (Hübner)

Giovanni Iadarola, UniFG

Poster#27

Phytopathogenic fungi vectored by invasive bark and ambrosia beetles and approaches for their sustainable management

Mariangela Benedetta Costanzo, UniCT

Poster#28

Use of Plant Growth Promoting Bacteria on Mediterranean crops: a preliminary study on wheat

Annalisa D'amelio, UniFG

Poster#29

***Vitis vinifera* L: cv Cabernet Sauvignon and Grenache under different water regimes and nutrient availability: a physiological and molecular study**

Gabriella Vinci, UniUD

Poster#30

A statistical model for the characterization of agro-food waste: an exploratory study

Alessandro De Santis, UniFG

13:03 – 14:00 Lunch break

14:00 - 14:45 5th Keynote:
University Museum System: public engagement and cultural activities
Paolo Inglese, University of Palermo

1st YEAR SHORT PRESENTATION SESSION POSTER

Chairpersons: Antonio Biondi
14:45 – 15:15

Poster#31
Use of Microalgae for sustainable and regenerative agriculture
Giuseppe Bonfante, UniCT

Poster#32
Selection and characterization of Plant Growth Promoting Bacteria for a sustainable valorization of unexploited resources
Angela Guerrieri, UniFG

Poster#33
Biocontrol of Citrus Mal secco: advances on effectiveness of BCAs based-formulations against *Plenodomus tracheiphilus* and deeply understanding of their population dynamics
Giuseppa Rosaria Leonardi, UniCT

Poster#34
Precision Grapes Harvesting: A Robotic Solution for Grapes Fruit Detection and Picking using Machine Learning
Maria Matloob, UniFG

Poster#35
Development and application of robotic technologies in the food sector
Eleonora Di Palma, UniFG

Poster#36
Sustainable viticulture: different strategies to enhance the resistance to the main fungal diseases on Sicilian cultivars
Valeria Ereddia, UniCT

Poster#37
Study of natural (plants extracts) and biological (fungi/bacteria) means for the control of fungal pathogens and weeds
Thomas Conte, UniFG

AFTERNOON SESSION

Chairpersons: Liviana Sciuto & Marco Tappi

15:15 – 15:30 *Presentation#20*
The potential use of non-destructive optical-based techniques for detection of chilling injury and physiological disorder in fruits and vegetables
Lucia Russo, UniFG

15:30 – 15:45 *Presentation#21*
***Aureobasidium* spp: strain UC14 mitigates patulin production by Penicillium expansum Link: on apple**
Rudy Cignola, UniUD

15:45 – 16:00 *Presentation#22*
Insights on immune and inflammatory responses of rainbow trout (*Oncorhynchus mykiss*) affected by Lactococcosis or submitted to vaccination against *Lactococcus garvieae*
Sarker Mohammed Ibrahim Khalil, UniUD

16:00 - 16:30 Coffee Break

16:30 - 16:45 *Presentation#23*
A Multifaceted Study of Packaging Influences on Quality and VOC Emission Behavior in Fresh-cut Artichoke
Ashraf Jahan Zaib, UniFG

16:45 - 17:00 *Presentation#24*
Valuing Recreation in Italy's Protected Areas Using Spatial Big Data
Laura Giuffrida, UniCT

17:00 - 17:15 *Presentation#25*
IoT-based herd management solutions: revolutionizing livestock supervision and care
Dominga Mancuso, UniCT

17:15 - 17:30 General conclusions of the day

17:30 - 18:30 Poster Session 1st year students

THURSDAY, SEPTEMBER 28

09:00 – 09:45 6th Keynote
How ruminants learn to select nutritious diets and avoid intoxications
Pilar De Frutos, Consejo Superior de Investigaciones Científicas Leon

MORNING SESSION

Chairpersons: Valeria Cafaro & Sarker Mohammed Ibrahim Khalil & Muhammad Yaser Khan

09:45 – 10:00 *Presentation#26*
Temperature alters the preference of stingless bees (Apidae, Meliponini) for food contaminated with acephate and glyphosate
Livia Maria Negrini Ferreira, UniCT

10:00 – 10:15 *Presentation#27*
Effect of dietary chitin on growth performance, nutrient utilization, and metabolic response in rainbow trout (*Oncorhynchus mykiss*): an in vivo and in vitro study
Giulia Pascon, UniUD

10:15 – 10:30 *Presentation#28*
Characterization of traditional ricotta cheese produced in Sicily: focus on the different varieties produced, analysis and shelf-life evaluation:
Guido Mangione, UniCT

10:30 – 10:45 *Presentation#29*
Green solutions and innovative technologies for post-harvest management and safety of food products of the organic and zero-residue citrus production chain
Rovetto Ermes Ivan, UniCT

10:45 – 11:00 *Presentation#30*
Pre (Nitrogen fertilization) & Post harvest factors (Packaging materials, number of micro-perforations) affecting quality and shelf life of fresh green leafy salads:
Aysha Saleem, UniFG

11:00 – 11: 30 Coffee break

11:30 – 11:45 *Presentation#31*
Comparative Phycoremediation Performance of Three Microalgae Species in Two Different Magnitude of Pollutants in Wastewater from Farmhouse
Emanuele La Bella, UniCT

11:45 – 12:00 *Presentation#32*
Partial substitution of corn by almond, pistachio, or hazelnut skins in sheep diets: effect on rumen fermentation in vitro
Martino Musati, UniCT

12:00 – 12:15 *Presentation#33*
Effect of different formulations of lithium and acetoacetate on apoptosis of lung cancer cell lines
Maria Ester La Torre, UniFG

12:15 – 12:30 *Presentation#34*
Addressing quality and sustainability in the organic durum wheat supply chain
Silvia Zingale, UniCT

12:30 – 12:45 *Presentation#35*
Catastrophic weather events and the latent demand for crop insurance
Marco Tappi, UniFG

12:45 – 13:00 *Presentation#36*
Eating time as a useful indicator in dairy farm management
Eleonora Florit, UniUD

13:00 – 13:15 *Presentation#37*
New approaches for sustainable soil and water agricultural management
Serena Guarrera, UniCT

13:15 – 14:00 Lunch Break

14:00 – 15:15 7th Keynote
How to write a successful Marie Skłodowska-Curie proposal
Raimondo Riccardo, University of Catania

15:15 – 15:45 8 th Keynote The way I see bugs
Giancarlo Colelli, University of Foggia

15:45 – 16:00: General conclusions of the day

16:00 – 16:30 Coffee break

16:30 - 17:15 Closing Session

17:30 – 18:30 Visit to Museo dei Saperi e delle Mirabilia siciliane, Piazza Università, 2, Catania

20:00 – 23:00 Social Dinner at Museo Diocesano, Via Etnea 12, Catania

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CLOSING OF THE 5TH JOINT MEETING OF AGRICULTURE

5th Joint Meeting of Agriculture-oriented PhD Programs

25-28 September 2023

BOOK OF ABSTRACTS

Monday, September 25

Presentation#1

Selection of new *Ricinus communis* L. genotypes and improvement of the agronomic management in order to create a biorefinery in semi-arid Mediterranean environment

Valeria Cafaro – *valeria.cafaro@phd.unict.it*
Salvatore Luciano Cosentino
University of Catania

The current world scenario is characterized by an extreme climate crisis, a response to the overexploitation of natural resources. Greenhouse gas emissions (GHG), agricultural intensification, population growth, and demand, accentuate severe climate change. To overcome these increasing problems, the use of fossil fuels must be reduced to a minimum, and the enhancement of energy crops becomes a valid solution to the request of obtaining renewable energy. In line with European policies, such the Agenda 2030, and the Renewable Energy Directive (RED), aiming to increase the energy independence of the European Union and the obtainment of 'clean and green energy', the production of biofuels is a valid alternative to meet these ambitious goals. In this context, the adoption of crops, cultivated in marginal lands, which does not compete with food production, and the possibility of exploiting these degraded areas, become one of the main topic on which to focus for further scientific research. Within this framework, the present thesis focused on the selection and the improvement of the agronomic management of castor (*Ricinus communis* L.) in order to assess its adaptability and potentiality in the Mediterranean region. Specifically, the research activities attempt to: (i) review the current knowledge on the adaptation capacity of castor in the Mediterranean environment; (ii) select a local genotype adapted to the Mediterranean climate; (iii) study of the germination temperature requirements of local and dwarf genotypes of castor; (iv) evaluation of the response to salinity stress in the germination of different castor seeds; (v) assess the best sowing date and comparison between the local genotype and dwarf hybrids. Overall, the present research highlighted the best combination between genotypes and environment of cultivation, in relation to temperature and salinity. These results can provide a valid base for further studies and for the exploitation of castor in the Mediterranean.

Presentation#2

New technologies for the Ecological Transition in agriculture: nanomaterials, SIGS and plant phenotyping

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Increased anthropogenic activity and consequent climate change are causing significant damages in the agro-ecosystem, including worsening environmental stresses on crops and inefficient use of resources. Hence, it becomes essential to develop sustainable solutions to ensure adequate production efficiency and limited impact. Recent innovations include alternatives to be used as partial replacement of agrochemicals for crop protection or nutrition, as well as smart technologies to detect vegetation responses to environment in order to improve agronomic management planning. In this context, the present research firstly aimed to develop

efficient ways for sustainable crop protection using natural nanomaterials obtained through circular economy (mainly chitosan-based). These nanoparticles (NPs) have also been employed as carriers for specific double stranded-RNA sequences, aimed at making the so-called *Spray-Induced Gene Silencing* technology more efficient. This strategy, through topical application of RNAs targeting pathogen genes to plant material, may enable disease control. For this purpose, after preliminary analyses on NPs' properties (alone and functionalized) and on their behavior when sprayed on tobacco leaves, inhibition tests on *Botrytis cinerea* were carried out. To do it, NPs conveying dsRNAs with interfering function on fungal metabolism have been employed. Secondly, another experiment was conducted with the aim of developing an investigation method for plant phenotyping. Different traits of the leaf surface of four invasive *Amaranthus* species were studied, using imaging techniques and multivariate statistical analysis. This method has made it possible to identify traits able to describe plant adaptive responses, useful as supporting information for genotype studies. Both lines of research, as innovative and complementary, are worthy of being developed for the eco-sustainable management of the agro-ecosystem.

Presentation#3

Ochratoxin A and Aflatoxin B1-producing *Aspergillus* spp. in Italian nuts. Detection and evaluation of ozone as an alternative control strategy

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Italy produces an increasing amount of high-quality pistachios, mainly in Sicily in the Bronte area. The green pistachio of Bronte (Pistachio Verde di Bronte) is officially registered as an Italian Protected Designation of Origin (PDO) and is a highly valued global trade commodity. In addition to pistachio, Italy is also famous for the production of almond, which is the most consumed tree nut is the world. The quality of these nuts can be impaired by post-harvest contamination by certain widespread fungi belonging to the genus *Aspergillus*. These are double-edged threats because they can synthesize different toxins, e.g., ochratoxin A (OTA) and aflatoxin B1 (AB1), which are serious hazards to humans and animals. This study aimed to evaluate the level of Aspergillus contamination in Italian nuts and revealed, for both pistachios and almonds, a high presence of black and green Aspergillus spp. This latter group was mainly represented by A. flavus but also A. parasiticus. HPLC analysis revealed that all of the isolated strains belonging to these two species showed the capacity to produce AFB1 at various levels. Furthermore, this study has successfully developed a rapid and accurate way for the detection of these contamination by designing kits based on Loop-mediated isothermal amplification (LAMP), these kits target specific regions in genes involved in mycotoxin biosynthesis pathways. Finally, it proved the efficacy of ozone gas as an alternative eco-friendly treatment which showed important levels of inhibition of *Aspergillus* spread in nut samples after harvest and throughout long storage. Overall, this project allowed to broaden understanding of Italian nuts' contamination by mycotoxin-producing Aspergilli and proposed successful methods to detect and manage these contaminations.

Presentation#4

Filling in the gaps: towards a deeper understanding of *Varroa destructor* longevity and reproduction under laboratory conditions

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The ectoparasitic mite *Varroa destructor* is involved in the worldwide decline of honey bee colonies. Despite its importance, some relevant questions regarding the mite's biology are still open and, in particular, the longevity of the parasite on its host and the stimuli triggering reproduction. Since the entire life cycle of the *Varroa* mite takes place within the hive it is difficult to solve these questions by means of *in vivo* studies. The best solution would be an artificial rearing system which, however, hasn't been developed yet. We have tried to fill some relevant knowledge gaps by studying the mite under lab condition on its host. In particular, we assessed the longevity of mites feeding on adult honeybees (A) or on honey bee larvae replaced every 3-4 days (L), or every 10-12 days (PS). We have also made some progress in the development of an artificial feeding system. In particular, we tested two different set-ups, three diets (lyophilized larvae, haemolymph and an artificial diet developed by Bruce et al., 1988), and several membranes for delivering the food (polyamide, PTFE, parafilm, polyethylene). Mites maintained on larvae changed every 3-4 days (L) survived longer than 70 days, which is significantly longer than those kept on PS and on A. The most appetible diet appeared to be the one containing honeybee components; the polyethylene membrane was the most easily perforated by the mite and easy to use. The data on mite's survival would allow to better calibrate the simulation models of the Varroa population dynamics and can be regarded as a necessary reference for the evaluation of ongoing attempts to rear the parasite under artificial conditions.

Presentation#5

Antifungal activity of *Lactiplantibacillus plantarum* mediated by inducible VOCs

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Undesired microbiota, such as filamentous fungi, negatively impacts the food sector leading to huge losses of food produce. For this reason, preservatives are often used to reduce microbial contamination. In this context, the use of food-grade antagonistic microorganisms has gained international relevance as a promising alternative to synthetic additives. Lactic Acid Bacteria (LAB) with antifungal activity might have the strain-specific ability to control decay agents and their application as bio-control tools is growing worldwide. In this work, eight *Lactiplantibacillus plantarum* strains were selected and their antifungal activity against *Aspergillus niger*, one of the main fungal contaminants of foods, were deeply investigated. The overlay method was used for an initial fast screening, then the presence of antifungal metabolites was evaluated in the supernatants (CFSs) by HPLC/DAD and in the volatile compounds produced by GC–MS analysis. Contribution of volatile organic compounds (VOCs) to antifungal activity was assessed in a plate-on-plate method without physical contact between molds and LAB. In order to determine the presence of inducible antifungal VOCs, fungal-LAB co-cultures were carried out in glass tubes for direct GC-MS analyses. Antifungal VOCs, such as acetic acid, 2-Nonanone and 2-Undecanone are produced constitutively by all strains. Whereas, fourteen VOCs appeared only in the fungal-LAB co-cultures. Six VOCs out of fourteen identified in co-cultures, and the three

VOCs previously mentioned were individually tested for antifungal activity against *A. niger* in airtight petri dishes assay. Trans-2-Octenal and 2-Nonanol were identified as the compounds with the highest activity against *A. niger*. These results showed that antifungal VOCs produced by *L. plantarum* could effectively inhibit the growth of *A. niger*. In addition, different antifungal VOCs were detected only in fungal-LAB co-cultures, pointing to metabolism modulation mediated by VOCs that results in an enhanced antifungal activity.

Presentation#6

Diversity of *Botryosphaeriaceae* species on Mediterranean and Tropical plants

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Botryosphaeriaceae are important fungal family distributed worldwide and able to persist as endophytes in healthy trees and saprophytes in dead tissue. Moreover, they have the ability to survives as latent pathogens and cause disease when the host is under stress. These fungi are highly polyphagous and cause several symptoms that can compromised agricultural production and the esthetics value of ornamental crops. Climate is the main factor affecting the distribution of these fungi, and nowadays as consequence of climate change some species could spread easily and became a serious threat for agricultural, ornamental and forestry ecosystem. During these years we conducted research on tropical and ornamental crops that are spread in Sicily (Italy) and are threatened by *Botryosphaeriaceae*. Among them, avocado (*Persea americana*) represents an important crop which is increasing its production area year by year. On the other hand, an increase of disease symptoms is also being observed in the orchards. At the same time, ornamental crops in the urban area and in nursery showed a high diseased incidence. In detail, Indian laurel-leaf fig (*Ficus microcarpa*), considered one of the most common urban trees cultivated in the warm region, and different species of *Acacia* in nursery, showed high disease symptoms incidence. The present research project aimed to conduct surveys in the main production area of avocado in order to highlight the diversity of the *Botryosphaeriaceae* species, and to investigate the phytopathological status of Indian laurel-leaf fig and *Acacia* sp., in urban area and nursery, respectively. Results of the morphological and molecular characterization revealed presence of different *Botryosphaeriaceae* species and pathogenicity test confirm the capability of the recovered pathogens to cause diseases.

Presentation#7

Experimental cheesemaking using plant-based milk-clotting enzyme and debittering adjunct culture

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In the present study a kiwifruit enzymatic extract was used as milk-clotting enzyme for cheesmaking. The presence of the enzyme actinidin in the tissues of the kiwifruit was achieved throught a polyacrylamide gel electrophoresis SDS-PAGE. In addition, the *Lactococcus lactis* subsp. *lactis* bv. diacetylactis Q5C6 strain, selected for specific aminopeptidase activity, was used as adjunct culture to reduce the bitter compounds generated by actinidin, during cheese manufacture and ripening. Two experimental cheesemaking trials were

carried out and the obtained cheeses was subjected to physico-chemical, microbiological and sensory evaluation and compared to cheeese clotted with animal rennet, used as control. Results showed that, the use of the kiwifruit enzymatic extract determined changes in fat, ash, and protein content respect to control cheese. In addition, higher values of mineral compounds were observed in the experimental cheeses than control ones. The low protein content observed in cheese samples clotted by using the kiwifruit extract and inoculated with the debittering adjunct culture could be related to the proteolytic activity exerted by the selected adjunct culture. Interestingly, the *L. lactis* subsp. *lactis* bv. diacetylactis Q5C6 strain, inoculated at 1% (v/v), was able to reduce the bitter taste obtaining a final product with a sensory profile comparable to cheese clotted by animal rennet.

Presentation#8

Development of molecular markers for sweet orange traceability

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Among Citrus species, sweet orange [*Citrus sinensis* (L.) Osbeck] is the most important in terms of production volumes and cultivated areas. Italy is among the top ten producing countries worldwide and the leading producer of blood oranges, a group of varieties characterized by the synthesis and accumulation of anthocyanins in the fruit. Despite the hybrid origin of sweet orange (involving numerous intercrosses of pummelo and mandarin), the entire cultivated germplasm derives from spontaneous mutations selected and propagated over the years and differing for several traits related to fruit quality, ripening period, resistance to biotic and abiotic stress etc. The wide array of sweet orange varieties is one of the most remarkable examples of the role of somatic mutations in determining intraspecific diversification. Such variability needs the set-up of reliable and easily accessible tools for varietal identification along the whole production chain: from nursery to table. The development of molecular markers, based on the sequencing and the analysis of the plant genome, allow a precise varietal identification through the set-up of marker essays. To this extent, a germplasm collection composed of 129 samples was genotyped and phenotyped. As for the genotyping, a whole-genome resequencing approach using Illumina platform at a genome coverage of 40X was performed allowing the detection of SNPs (Single Nucleotide Polymorphisms), INDELs and structural variants (SVs). To date, the discovered SNPs markers was validated via HRM analysis, enabling the discrimination among the sweet orange accessions included in the study. In addition, markers shared among groups or subgroups of genotypes were selected and resulted useful to identify juice contamination.

Presentation#9

Identification and Characterization of Vitamin B2 overproducing LAB

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Some strains of lactic acid bacteria (LAB) are able to produce and release beneficial compounds in foods. Among these functional and bioactive elements there are micronutrients such as vitamins. Specifically, some foods after fermentation with LAB showed high content in B vitamins due to microbial biosynthesis. For this reason, it's possible to increase the quality of fermented foods by enriching the raw material with selected microorganisms that possess these inherent characteristics. In this study, in particular, we focused on the identification and characterization of microorganisms isolated from wild fruits, which derived from mediterranean area. Thus, 159 LAB strains were pre-selected for their growth skills in chemically defined riboflavin-free medium (CDMRF) and later, evaluated for their riboflavin (vitamin B2) production abilities. Therefore, seven LAB strains belonging to the *Lactiplantibacillus plantarum* species were identified and selected according to their resistance to increasing concentrations of roseoflavin (a toxic analogue of riboflavin), showing a phenotype of vitamin B2 overproduction. Vitamin B2 levels were quantified by fluorescence, and one among the spontaneous mutants, produced a high level of riboflavin between 5 and 6 mg/L. Subsequently, molecular characterization of the riboswitch was done for all previously selected mutants, and by aligning sequences of the RFN element of the mutants with the parental, the mutation points in the aptamer were found. In particular, it was seen that the highest producer has a mutation in G to T at position 91, while the lowest producer has a mutation in C to A at position 78. In the future, the best of the selected riboflavin over-producer strains will be used for the preparation of functional foods and beverages, evaluating the growth conditions in the most appropriate medium, trying to improve their efficiency and productivity.

Presentation#10

***In vitro* tissue cultures from *Coffea arabica*: from callus to cell suspension**

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Coffee plant has potential applications in human therapy and cosmesis as a source of phytochemicals. Cell suspension cultures (CSCs) provide a technological option for large-scale production of high-value bioactive compounds. A well-defined protocol for the induction of non-embryogenic and friable callus is still missing for *Coffea*, hampering the possibility to develop and maintain a viable CSC for molecular farming purposes. Amongst plant growth regulators (PGRs), auxins (AUXs) and cytokinins (CKs) are generally required in the context of callus formation. Since their critical role, trials were arranged in three steps aiming at defining: i. AUX-CK concentration, 5x3 factorial experiment with 5 levels of kinetin (0, 0.5, 1, 2 and 4 mg L^{-1}) and 3 levels of 2,4-dichlorophenoxyacetic acid (1, 2 and 3 mg L^{-1}); ii. CK type and iii. AUX type. A total of 17 PGRs were tested. Leaf discs from *C. arabica* cv. Bourbon Red and Castillo were used as explant sources. The fresh explant+callus fresh weight and callus texture were evaluated for each treatment. After calli transfer in liquid media, CSCs were stabilized into fine suspensions, and cell growth was monitored regularly by both FW and

DW measurements. Cell viability was determined by FDA staining. 1 mg L^{-1} of kinetin, as CK, and 2,4,5-trichlorophenoxyacetic acid, as AUX, was found as an efficient PGRs combination not only for callogenesis, but also for CSCs development, which displayed a typical sigmoidal shape-growth curve and a high percentage of viable cells. This protocol could be extended to other *Coffea* cultivars and species in order to investigate the potential of these plants in production of bioactive compounds and further enhancement throughout elicitation strategies.

Presentation#11

Morphological analyses and quantification of the cuticle in table grape berries

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The extreme and unpredictable weather events significantly threaten Mediterranean fruit cultivation and worsen damage from abiotic factors. Table grapes (*Vitis vinifera* L.), often suffer from depreciation due to various pathologies and physiopathologies, including fruit cracking in specific years. This study aimed to examine the thickness and characteristics of the cuticle, along with the morphometric traits of the fruit pulp, in five newly developed table grape hybrids and in cv Italia. The analyses were conducted from fruit setting (BBCH71) to the ripe fruit stage (BBCH89) in a variety evaluation field located in Mazzarrone (CT); histological examinations were carried out on fruit sections embedded in resin and stained with Sudan IV, as well as the quantification of the extracted cuticle was conducted to obtain the value per cm^2 of cuticle during the growing season. In almost all the examined hybrids, a significant decrease in cuticle thickness was observed during the growth phases (P-value < 0.05). The highest value (5.035 µm) was found in the fruit-setting phase of the cv Italia, while the lowest value (1.780 µm) was observed in the fully matured A17-7 hybrid. The P18-2 hybrid exhibited a sigmoidal repetitive trend of the cuticle thickening during the development phases, and the same trend was observed in the OPAS1 genotype. Regarding the analysed morphometric traits, the results indicate that in the OPAS1 and in A17-7, the cells area does not vary significantly during the growth phases. Conversely, in the other hybrids, it increases significantly. Additionally, it can be observed that all the examined hybrids exhibit an inversely proportional trend between cells roundness and aspect ratio.

Presentation#12

INTEVINE: Multi-omics data integration to decode the interaction between soil and grapevine

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Vitis vinifera exhibits an intriguing relationship with the soil microbial community. Considering that the edaphic properties of the soil influence his microbiome composition, investigating the relationship between soil chemical-physical properties, soil microbiome, and root transcriptome using the grapevine as a model plant could provide valuable information. This project aims to develop an integrative approach to decode how soil composition and root transcriptome influence each other. To achieve that, we are comparing the rhizosphere microbiome of grapevine plants grown in different soil types via metagenomic analysis and

integrating such data with transcriptome analysis of the plant roots. In addition, given the complexity of the soil-plant interaction, we have included in the project additional data from various fields. In particular: chemical properties of the soil samples, multispectral imaging of the leaves surface, continuous in vivo monitoring of the changes occurring in the sap ion's status via the Bioristor sensors, and ionomics of roots and leaves. The resulting data will be integrated via bioinformatics approaches to obtain an ample and clear view of the subject. Currently, the samples have been collected and are being analyzed. We have already obtained the results of leaf ionomics, metagenomics, transcriptomics and soil chemistry, which at first analysis appear to show differences between plants grown in sandy soils and those with a higher organic component. As we receive the results, these will be compiled into a metadata table that will serve as the basis for bioinformatics analysis, along with the sequencing output.

Presentation#13

Toxoplasma infection in goats in Pakistan: risk factors and public health significance

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Toxoplasma gondii is a parasitic protozoan that infects warm-blooded animals and humans; associated with fetal mortality in small ruminants and humans, especially in the immunocompromised. Infection mainly occurs through contaminated vegetables, water, and undercooked or raw animal products (milk, meat) from infected animals. This study aimed to investigate the occurrence of *Toxoplasma gondii* in goat farms, risk factors influencing the infection and its public health significance in Layyah District (Pakistan). All goat farms in study area were statistically stratified by size, and 110 were selected with 12 goats from each farm and both serum and milk samples (1320 each) were tested by ELISA. A questionnaire was also administered to 110 farmers for risk factor analysis. From three highly seropositive farms, a total of 360 milk samples from 40 goats were collected in each farm at three different lactation intervals. Furthermore, brain and placenta tissue samples from three aborted goats were collected. Milk and tissue samples were tested by *q*PCR (B1 gene) and the isolates were genotyped. Out of the total sera and milk samples, 31.5% and 27.12% were positive, respectively, and 89% of the flock had at least one seropositive goat. Significant interactions were related to goat farms having floor of dirt and kitten presence. Class age, abortion history and water source supply were modulated by owner education levels. Among three highly seropositive farms, all had at least three *Toxoplasma* DNA positive goats with overall positivity of 3.88%. Except one fetal brain, all aborted tissues were found positive. This is the first and the largest epidemiological study on *Toxoplasma gondii* in goat farms in Pakistan. The remarkable presence of this pathogen may pose a production threat to small-stock industry and to public health.

Presentation#14

Energy recovery from treatment wetlands biomass to enhance their sustainability in semi-arid climate conditions

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Treatment wetlands (TWs) are Nature-Based Solutions increasingly used worldwide for wastewater (WW) treatment able to remove mineral and organic pollutants through both physical and biochemical process. Besides the reusable effluent, the TWs produce as main output plant biomass that need to be harvested and disposed at least once a year with significant management costs and TW temporary out of service. This study aims (i) to evaluate the potential of TWs biomass for local energy production and (ii) to understand TW hydraulic characteristics effects on the biomass biomethane yield. Specifically, it was addressed by determining the Biochemical Methane Potential of common reed (CR) (*Phragmites australis*) samples collected at three harvest times from the 10-years-old horizontal subsurface treatment wetland (HSTW) used as a secondary WW treatment system for the IKEA® store located in Catania (Eastern Sicily, Italy). Furthermore, the falling head test was conducted to assess the hydraulic conductivity (*Ks*) variation in the HFTW, in order to understand the influence on the CR biomethane production. Average methane content values were 130.58 Nm^3CH_4/tVS (±19.48), 212.70 Nm^3CH_4/tVS (±27.49) and 72.43 Nm^3CH_4/tVS (±28.42) in August, September, October 2022, respectively. *Ks* was strongly correlated with both dry matter ($R^2 = 0.58$) and fiber content ($R^2 = 0.74$). In the framework of a circular economy, results showed the successfully possibility of integrating the bioenergy production into TWs. The research could contribute (i) to encourage plant operators to reuse biomass from TWs for local energy production and (ii) to help plant operators to understand *Ks* effects on the biomass biomethane yield, in order to increase the sustainability of the system and to reduce the maintenance costs.

Presentation#15

Physiological and production evaluation of different populations of Sicilian Wheat Landraces

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There is a growing concern in consumers about ancestral sicilian wheat populations cultivated before the beginning of crop breeding activities for their organoleptic and nutraceutical characteristics. As demand grew, they were recovered by farmers for marketing. In this context it is appropriate to undertake experiments to characterize these populations from the physiological and productive point of view and to develop the agronomic techniques most suitable for their cultivation both in conventional and organic regimes. In particular, nitrogen fertilization and weed control are techniques to be developed in relation to the need to obtain products that are qualitatively and quantitatively suitable for farmers and consumers. My research aims at studying the "Physiological and production evaluation of different populations of Sicilian Wheat Landraces". In the years 2021-2022 and 2022-2023, three experimental factors were studied: 1) 18 genotypes: twelve local Sicilian populations of durum wheat ("Bidì", "Castiglione Glabro", "Giustalisa", "Margherito", "Perciasacchi", "Realforte", "Ruscia", "Russello – Priziusa", "Russello Ibleo", "Timilia", "Tripolino" e "Urria"), one local Sicilian populations of soft wheat ("Maiorca"), one old variety of durum wheat ("Senatore Cappelli"), three commercial variety of durum wheat ("Core", "Mongibello" e "Amedeo") and one commercial variety of soft wheat ("Bologna"), 2) Management: organic (no fertilization and no weeding) and conventional (nitrogen fertilisation, chemical weeding) 3) Soil water content: Irrigation during grain filling period and rainfed conditions. Weather conditions and evapotranspiration potential were monitored, via electronic sensors

(Delta-T, WS-GP1 Compact) and a Class A evaporation pan. During the growing season, measurements of the main phenological phases, as well as morpho-biometric and physiological traits (leaf photosynthesis and leaf transpiration), using a portable photosynthesis system (LCi-SD, ADC BioScientific, Great Amwell, Hertfordshire, UK) were carried out. Currently, the results achieved so far are under processing.

Presentation#16

Novel Plant Biostimulants to Improve Sustainability and Functional Traits of Pivotal Mediterranean Crops: Tomato and Carrot

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Among all agriculture inputs, nitrogen (N) fertilizers generally show one of the least use efficiency, as a considerable part of the applied doses are leached by drainage water, compromising water bodies, or volatized as reactive N gases into the atmosphere. Moreover, N-fertilizers require huge amount of energy to be produced. It follows that optimizing Nitrogen Use Efficiency (NUE) is a crucial step toward a more sustainable agriculture. In this regard, several biostimulants have been shown to be able to significantly improve the uptake of nutrients and their overall use efficiency. The aim of this research project is to test a range of novel products for their biostimulant activity on tomato and carrot, two pivotal crops in the Mediterranean region. The biostimulant activity will be evaluated in terms of NUE, crop productivity, quality, and nutraceutical traits of the production. The experimental activities were organized in two parts: 1) a set of screening trials in which experimental biostimulant extracts were tested on tomato plants, and 2) field test on greenhouse tomato and open field carrot. The results from the screening trials suggest that exhausted cell culture media sourced from cosmetic plants, particularly *Nicotiana sylvestris*, can be an effective plant biostimulant for enhancing plant physiological responses and biomass production, even in conditions of N-deficiency. The investigation not only sheds light on the practical application of these media as biostimulants, but also provides insights into the underlying molecular mechanisms. However, the observed positive effects need to be investigated in the second part of the project with long-term experiments to determine whether initial growth stimulation reflects improved agronomic performance.

Presentation#17

Variation of the Dog-Microbiome in Relation to Genetic and Environmental Factors

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The objective of this doctoral thesis was to enrich the current body of knowledge by establishing a uniform analytical methodology. This comprehensive method, spanning from feces collection to the conclusive taxonomic annotation, was applied across all conducted research endeavours. Particularly in nutritional investigations, alterations in diet often revolve around the adjustment of individual nutritional elements, neglecting the consideration of the broader impact of diverse diet types on the dynamics of the gut microbiome. Moreover, the primary objective was to construct a substantial database of information sourced from subjects

in good health. Pursuant to this goal, an effort was undertaken to profile the gut microbiome of healthy dogs or dogs with liver diseases. The endeavour aimed to discern whether any factors exerted an influence on the microbiome either in the absence or presence of disease, with the intention of categorizing subjects into broader groups to streamline subsequent analyses. Five studies were carried out and the samples were collected from subjects housed on kennels or at homes, referred to veterinarians for clinical visits and nutritionists for dietary advice, in training and education centres and in shelters. The microbiome analysed by sequencing the 16S rRNA gene and the data entered in the remote archive already built by the research group. In addition to the annotations and the construction of phylogenetic trees of microbial communities, the study of alpha and beta diversities was carried out. The set of data appropriately treated with multivariate statistical methodologies, including principal component analysis (PCA) approaches, principal coordinate analysis (PCoA), and with machine learning approaches, such as random forest. Results are still under investigation, to assess how nutritional factors can shape gut microbiome in dogs.

Presentation#18

Combined agronomic approaches to obtain Mediterranean vegetables with enhanced nutraceutical profiles

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Micronutrient malnutrition (the so-called hidden hunger) nowadays is a concern in both developed and developing countries. Deficiency of micronutrients vital for human normal growth is a global health problem, and iron, zinc, iodine, and vitamin A deficiencies are the most prevalent ones. Simultaneously, there are supported recommendations for increased consumption of fruits and vegetables rich in carotenoids and phenols. In fact, an insufficient intake of these nutrients can ultimately lead to metabolic dysfunctions, such as impaired organs development in infants and several chronic diseases. In the Mediterranean horticultural context, tomato is among the most important vegetable crop. Given its widely consumption and rich phytonutrients profile, tomato is good candidates for the development of biofortified products useful to manage the hidden hunger. In this scenario, this research aims to evaluate novel tomato cultivars recently introduced in the reference area and design an agronomic protocol able to enhance tomato content of minerals and secondary metabolites. To achieve these objectives, two distinct experimental trials were conducted. In the first trial, fifteen polychromatic mini-plum tomato cultivars, recently introduced in Southern Italy, were evaluated for their bio-agronomic and qualitative attributes. Beyond observing genetic differences in yield and carpometric traits, our findings revealed significant variations in functional traits among the different color groups. Notably, the brownish-fruited cultivars exhibited the highest concentrations of total phenols, alongside chlorophylls *a* and *b*. Conversely, the red-fruited cultivars displayed the highest concentrations of total carotenoids, particularly lycopene, in stark contrast with yellow-fruited cultivars. Shifting our focus to the second trial, its objective encompassed the establishment of integrated biofortification protocols, involving a synergistic application of Zn supplements and plant biostimulants. Our preliminary results underscore a positive influence on the mineral composition of the tomatoes without affecting yield, providing insights toward the development of Zn biofortification protocol for this crop.

Presentation#19

Unlocking the physiology and molecular bases of phytoplasmas infection: an update

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The symptoms of phytoplasma infections vary depending on the pathogen phylogenetic group and the host plant. However, leaf discoloration is a common symptom in most phytoplasma diseases. It indicates that the infection affects the chloroplast and its components. In fact, disruptions in the photosynthetic apparatus and the carbohydrate metabolic pathways are the most significant changes in response to the infection. Despite the growing understanding of the chloroplast's role as a target in plant diseases caused by effectors, its precise role during phytoplasma infections remains unclear. RNA-seq was employed to conduct transcriptome profiling in stolbur-infected tomato plants, resulting in the identification of a subset of genes exhibiting differential regulation in infected midribs. A gene co-expression network was performed revealing 14 modules evidencing crucial molecular players in the plant pathogen interaction specially for genes regulating photosynthesis, chlorophyll and carotenoids biosynthesis and photorespiration. Gas exchange (by Infrared Gas Analyzer, IRGA) and chlorophyll, carotenoids, reactive oxygen species (ROS) were analytically determined. The results were consistent with the data obtained from the RNA-Seq analysis. Chloroplasts play a central role in producing energy, hormones, and ROS. Nevertheless, phloem chloroplasts serve distinct functions by prioritizing energy provision over carbon fixation, which is the primary role of mesophyll chloroplasts. New experiments with the Micro-tom Aurea mutant, which carries a mutated allele (gene *Solyc01g008930*) that is unable to respond to light for processes like photomorphogenesis (i.e., chloroplast differentiation) have been started. Integrating transcriptomic profiling, protein expression with photosynthesis phenotyping we expect to better understand the interplay between chloroplasts and stolbur-infection in tomato plants.

Wednesday, September 27, 2023

Presentation#20

The potential use of non-destructive optical-based techniques for detection of chilling injury and physiological disorder in fruits and vegetables

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The increasing concern and awareness of the modern consumer regarding food including fruits and vegetables, has been orienting the research in the food industry to develop rapid, reliable, and cost-effective methods for the evaluation of food products including the traceability of the product history in terms of storage conditions. Since the conventional destructive analysis methods are time consuming, expensive, targeted and labour intensive, non-destructive methods are gaining significant popularity. Hyperspectral imaging is emerging as a powerful technology for predicting and assessing physiological damage in fruits and vegetables. This non-invasive and non-destructive methodology offers an unprecedented opportunity to detect early metabolic changes in fruits and vegetables, enabling timely interventions and improved post-harvest quality management.

In this study, we explored the application of hyperspectral imaging to predict physiological alterations in pomegranate fruit as chilling injury and internal black heart. Internal Black heart is a defect caused by fungi infection, very difficult to be identified because of the indistinct external appearance with the sound fruit. In this work we assess the potential of hyperspectral imaging method in the range of Visible-Near Infrared (VIS-NIR) (400–1000 nm) to predict non-destructively the defect. The model showed a promising result to classify defective fruit from sound fruit reaching R^2 of calibration and prediction at 98.5 % and 100 %, respectively. The outcome of this study indicates the promising potential for visible-NIR to provide non-invasive, rapid, and reliable early detection of internal defect of black heart in pomegranate fruit. In addition, tests were carried out on pomegranate during 120 days of storage for prediction of chilling injury, and data are still under elaboration.

Presentation#21

Aureobasidium spp. strain UC14 mitigates patulin production by _Penicillium expansum_ Link. on apple

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Penicillium expansum is the causal agent of apple blue mold and one of the causes of the production of patulin. The study displayed the efficacy of a potential biocontrol agent (BCA), *Aureobasidium* spp. (UC14), isolated from cold environment, in controlling the fungal growth and patulin production. The efficacy of UC14 was tested by *in vitro* antibiosis experiments. Volatile and non-volatile metabolites reduced *P. expansum* on average by 50%. To verify UC14 efficacy on apples, different concentrations of its cellular suspension were assayed. The concentration 1×10^8 cells mL^{-1} was the most efficient, completely inhibiting apple blue mold symptoms during the shelf-life week. The biological antagonism of UC14 was further demonstrated by qPCR analysis, with an almost totally reduction in the pathogen's abundance. During the cold storage, the BCA, displayed a good persistence on fruits showing a reduction of disease severity. Subsequently, apples were sampled and analyzed for patulin content. Results confirmed an activity of the strain on the reduction of the mycotoxin on '*Golden delicious'* and '*Fuji*' apples by 98.1% and 96.2% with respect to the control. The strain, displaying a promising effectiveness in controlling blue mold of apples and patulin, showed a potential as BCA to involve during the postharvest phase.

Presentation#22

Insights on immune and inflammatory responses of rainbow trout (_Oncorhynchus mykiss_) affected by Lactococcosis or submitted to vaccination against _Lactococcus garvieae_

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Lactococcosis (*L. garvieae*) is a major concern in farmed rainbow trout (*O. mykiss*). Basins are periodically affected by outbreaks and farmers resort to vaccination campaigns or therapy in order to limit the infection

outcomes. My PhD project aimed at improving the knowledge on the response of rainbow trout to *L. garvieae* by evaluating the immune/inflammatory reactivity after infections, as well as upon vaccinations. Firstly, a bibliographic revision was drafted as introduction of my thesis and submitted to a journal for potential publication. Secondly, we studied the immune profile of trout naturally exposed to *L. garvieae* (asymptomatic and symptomatic or vaccinated), considering parameters like leukogram, serum lysozyme/peroxidase/ antiprotease activity, bactericidal activity, total proteins and IgM, and specific antibodies to *L. garvieae.* Thirdly, another study was dedicated to the expression of immune related genes in *L. garvieae* infected *versus* healthy fish, as well as to explore the Near Infrared Spectroscopy (NIR, SCiO) as a novel approach to discriminate between them. The latter two studies have already been published in peer-reviewed journals. As fourth chapter of my thesis, we included an infield investigation on NIR (SCiO device) as a Novel Non-Invasive Tool for the detection of Lactococcosis in rainbow trout, which is drafted and under review. Finally, we performed an integrate study including histopathology and immune response evaluation to better describe the fish reactivity in the course of infection. We believe this all-encompassing approach will facilitate the understanding of this complex interaction and the selection of effective ways to prevent lactococcosis.

Presentation#23

A Multifaceted Study of Packaging Influences on Quality and VOC Emission Behavior in Fresh-cut Artichoke

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Packaging plays a crucial role in maintaining postharvest quality and extending the shelf-life of fresh-cut produce by modifying the internal atmosphere and minimizing moisture loss and microbial spoilage. On the other hand, packaging can release volatile organic compounds (VOCs) that may encounter the product, influencing characteristics such as flavor and safety, as well. This research thoroughly assessed the effects of different packaging materials on the quality of fresh-cut artichokes through three interrelated studies analyzing chemical changes in key molecules. The first study investigated the adaptability of twelve cultivars to be processed as a fresh-cut product, in terms of susceptibility to browning. The phenolic composition of four selected varieties, including phenol derivatives, is ongoing with the aim of elucidating some marker structures in browned samples by HPLC-MS/MS. The second study investigated the effects of micro-perforated (MP) polypropylene (PP), MP-polypropylene/polyamide (PP/PA), and MP-polylactic acid (PLA) on the physico-chemical, sensory, and VOCs of fresh-cut artichokes stored at 5°C for 10 days. Results showed that the PLA package is suitable to preserve the artichoke quality for 6 days in terms of volatile and sensory odor scores, and the PP/PA package can prolong the shelf life of fresh-cut artichoke till 10 days, although the PP/PA package emitted VOCs, leading to potential safety issues. To further understand packaging impacts, the third study profiled VOCs emitted from the packages using HS-SPME-GC/MS. A variety of compounds were identified; PP/PA emitted the greatest number of VOCs, most of them belonging to the class of branched alkanes and alkenes. Studying volatile emission kinetics from food packaging is critical for preserving fresh produce safety and quality. Therefore, the study of the release kinetics in controlled systems is ongoing to understand the release phenomenon in real systems of fresh-cut vegetables. These results have implications for the design of sustainable packaging solutions with low emissions of VOCs.

Presentation#24

Valuing Recreation in Italy's Protected Areas Using Spatial Big Data

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Protected areas offer unique opportunities for recreation, but the non-market nature of these benefits presents a significant challenge when trying to represent value in the decision-making processes. The most common techniques to value recreation are based on resource-intensive primary surveys which are difficult to perform at a large scale or in remote locations. This is true in the case of Italy, where a large and diverse network of protected areas suffers from lack of data. Here, we offer an alternative data source for the valuation of recreation by integrating the metadata of geotagged photographs from social media into single-site, individual travel cost models for 67 Italian protected areas. Count data model results are generally consistent with standard economic and consumer demand theory for ordinary goods, with a zero-truncated Poisson model returning down sloping demand curves for 50 of 67 sites. A significant travel cost coefficient was returned for 33 sites (p-value <0.05) for which consumer surplus estimates were found in the range between €6.33 and €87.16, with a mean value per trip of €32.82. Although not without their own challenges, the results presented highlight the possibilities of new forms of spatial big data as a novel data source for environmental economists.

Presentation#25

IoT-based herd management solutions: revolutionizing livestock supervision and care

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The use of animal monitoring devices in extensive systems has increased the interest of researchers in recent years. Monitoring animal behavior and location is crucial in this context for various reasons, including early detection of animal health issues, managing grazing areas, and understanding the impact of animals on the land. Many studies have employed GPS to track herds, highlighting the need to address challenges like sensors downsizing and developing high-energy-density batteries. Another critical challenge in extensive farming is the absence of a continuous and reliable telecommunication service. The proposed project aims to develop a new way of herd management that can support farmers in their activity by monitoring the behaviors of grazing animal with the help of modern low energy consumption solution. In the first phase of the project two case studies were compared to prove the applicability of an IoT-based lower-power global position system (LP-GPS) developed for locating and tracking cows in extensive systems. In particular, the system was used to test its battery life and signal coverage after the installation of a SigFox repeater in the grazing area, as well as to examine animal behavior within the considered pasture by using the Kernel Density Estimation (KDE) tool available in Geographic Information Systems (GIS) software. The installation of repeater has significantly reduced the loss of localization data but further improvements to the system developed to locate and track and monitor cows in extensive systems could be made. The next step, in fact, will be to examine cow behavioral activities, combining motion sensors (accelerometers) and GPS data to achieve the best technique of measuring animal activity in an extensive farm.

Presentation#26

Temperature alters the preference of stingless bees (Apidae, Meliponini) for food contaminated with acephate and glyphosate

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While foraging, the exposure of bees to agrochemicals due to floral contamination depends on the behavior of the bee, but also on several abiotic factors. However, few ecotoxicological studies have been undertaken under realistic weather conditions in the field. For the first time, we conducted a semi-field study to test if stingless bees prefer food contaminated with agrochemicals over non-contaminated food, under natural weather conditions. Colonies of *Plebeia lucii* Moure, 2004 (Apidae, Meliponini) were placed in a greenhouse and submitted to a preference test, where bees were free to choose between contaminated or non-contaminated food. Inside the greenhouse, we placed feeders with realistic concentrations of an insecticide (acephate: 2 mg a.i./L), an herbicide (glyphosate: 31.3 mg a.i./L) or a mixture of both (2 mg acephate/L and 31.3 mg glyphosate/L), in addition to non-contaminated food. To simulate a realistic scenario, experiments were carried out under natural temperature, humidity and light intensity, which were measured during the whole experiment. We found that at higher temperatures (>25ºC), bees displayed no preference for contaminated or non-contaminated food. Under lower temperatures (<25ºC), bees preferred feeders contaminated with agrochemicals. Our results show that agrochemical residues in nectar poses a threat to colonies of *P. lucii*, since foragers do not avoid contaminated food, despite detrimental effects caused by acephate and glyphosate to bees. We also show that even natural and small changes in environmental conditions can alter the colony exposure risk. Despite the interaction between temperature and the preference of bees for contaminated food, foragers collected contaminated food with agrochemicals, isolated or mixed, under all temperatures.

Presentation#27

Effect of dietary chitin on growth performance, nutrient utilization, and metabolic response in rainbow trout (*Oncorhynchus mykiss*): an *in vivo* and *in vitro* study

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Chitin is the second most abundant biopolymer in nature as it is a component of the exoskeleton of arthropods. Despite the dietary inclusion of chitin-containing ingredients has been claimed to be beneficial to fish health, controversial results have been reported in the literature. To investigate if or to what extent chitin affect fish performance, our study aims at assessing the response of rainbow trout, fed with increasing levels of chitin (1.5, 3.0 and 4.5%), in terms of growth, metabolic status, liver functionality, *in vivo* and *in vitro* nutrient digestibility. Before the main feeding-experiment, a preliminary trial was conducted to investigate the post-prandial kinetics of gene expression, enzymatic activity, and blood metabolites to identify and to set-up the optimal sampling time for each parameter. The results indicated that the best sampling time for intestine and

for blood metabolites was at 3 - 6 hours and 6 hours post-prandial, respectively. Consequently, to standardize the sampling procedures, at the end of the 10-week feeding trial, fish were euthanized 6 hours after the last meal and growth performance, blood metabolites, digestive and liver functionality were evaluated. More, to collect the enzymatic extract for *in vitro* protein hydrolysis, the intestinal tract of twenty spared specimens was removed. Although the increasing level of chitin in the diet, the *in vitro* data shown on one side no significative changes in protein degradability, and, on the other side, a good tolerance of rainbow trout to diets including up to 3% chitin. On the contrary, negative effects have been reported with higher chitin inclusion levels, indicating that 3% is the dietary limit level of chitin tolerance for rainbow trout.

Presentation#28

Characterization of traditional ricotta cheese produced in Sicily: focus on the different varieties produced, analysis and shelf-life evaluation.

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The present project is focused on production technologies and characterization of Sicilian artisanal ricotta cheese varieties, analyzing the chemical, sensory, and microbiological profile as well as the shelf life of the product. In the first step of the project, a review of the historical, technological, and analytical characteristics of ricotta cheese available in the literature was carried out. The available studies pertaining to ricotta cheese showed the main chemical and microbial characteristics of the product and the several parameters that affect the mechanism of the production process and the final characteristics of the product, distinguishing the two different ricotta cheese production, artisanal or industrial, with differences in the making process. However, just a few numbers of studies were found for artisanal ricotta production, which still needs to be characterized and studied. The second step of the project was focused on the characterization of the different ricotta cheese varieties produced, including the technology of production, and the evaluation of chemical, microbial, and sensory profiles. Ricotta cheese production shows considerable biodiversity, in terms of ingredients used, high variability of manufacturing processes, and peculiar organoleptic characteristics as well as a specific behavior of temperature and pH during the entire production process. Finally, the third step of the project, still in progress, focuses on the mechanisms behind differences in whey protein aggregation during the ricotta cheese making using different ingredients (salt, milk etc.) that lead to differences in appeal, namely the texture, moisture holding, and visual appearance. So far, no studies examined in depth the kinetics of the manufacturing process, including the whey protein agglomeration and flocculation in ricotta cheese manufacture. Understanding the flocculation and agglomeration reactions that take place in the artisanal ricotta cheesemaking will allow to demonstrate the peculiarity and the uniqueness of these artisanal productions.

Presentation#29

Green solutions and innovative technologies for post-harvest management and safety of food products of the organic and zero-residue citrus production chain

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Ensuring high-quality standards, safeguarding consumer health, and achieving an extended shelf life are essential factors influencing the competitiveness of citrus fruits produced in Mediterranean countries in both local and global markets. Fungal-induced rots stand out as significant contributors to post-harvest losses (averaging around 30%) in citrus fruits, significantly diminishing their shelf life. These fungal diseases emerge before or during harvesting, remaining latent until an incubation period concludes and often they are visible only during storage, transport and marketing. Certain fungal pathogens generated after harvest produce toxins that could potentially contaminate juices, raising concerns for human health. Traditionally, synthetic fungicides have been used to prevent post-harvest rots in citrus fruits; however, their prolonged use has unintentionally led to the development of pathogenic strains that are resistant, thereby compromising the effectiveness of certain active ingredients. Moreover, increasingly stringent laws and regulations have limited or even banned pesticide application, promoting the adoption of ecologically sound post-harvest fruit treatments. These treatments hinge on the utilization of environmentally friendly substances and bio-products derived from the natural microbiota associated with citrus fruits, all geared towards prolonging fruits shelf-life. The project's objectives include i. identification non-toxic green substances, such as GRAS agents, biostimulants, natural compounds, and bio-products, proposed for the management of citrus post-harvest rots; ii. development of new, sensitive, specific, cost-efficient and user-friendly diagnostic kits, based on Recombinase Polymerase Amplification (RPA), designed to identify quarantine pathogens that affect citrus fruits; iii. formulation of practical and responsive analytical methodologies, to facilitate the detection of mycotoxins in both the peel and juice of fresh citrus fruits.

Presentation#30

Pre (Nitrogen fertilization) & Post harvest factors (Packaging materials, number of micro-perforations) affecting quality and shelf life of fresh green leafy salads.

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In recent years consumption of fresh cut leafy salads significantly increased in Europe. Major challenges to extend the postharvest quality and shelf life of fresh cut salads are to find relation between pre and post-harvest factors in order to find optimal growing and storage conditions. The study was focused on the interactive effect of different levels of nitrogen fertilizer on post-harvest quality and shelf life of rocket leaves (Diplotaxis tenuifolia L.). Six levels of nitrogen T70, T94, T126, T154, T182 and T210 were applied. Samples were stored at (5°C temperature) to monitor quality changes over storage time of 18 days. For each quality attribute and N level, degradation curves were fitted with several models to find the best fit to describe kinetic. Quality parameters microbial load, vitamin C, and overall acceptability showed a direct relation with increase N

fertilization. Degradation kinetics were mostly described by first order reaction. Shelf-life prediction models were also validated within satisfactory statistical error values. Second study was carried out to evaluate the effect of packaging materials and number of micro-perforations on the release of VOCs in packaged cime di rapa. Fresh cima di rapa (Brassica rapa L.) leaves were packed in bags made of two different packaging materials Polyethylene Terephthalate (PET) and polylactic acid (PLA). For 22 * 16 cm2 packet dimensions three levels of micro perforations (0, 02, 20). 50 g samples were packed and stored at 5oC for a shelf-life study of 17 days. Bags were evaluated for quality parameters mainly volatiles through GCMS at different intervals of time. Results showed PET-0 was the first one to produce strong off orders on day 9 where PLA-02 showed the best sensory attributes and fresh like volatiles. Overall acceptability and volatile results showed not only different levels of micro perforation but barrier properties of packaging material also play an important role to maintain quality of cime di rapa.

Presentation#31

Comparative phycoremediation performance of three microalgae species in two different magnitude of pollutants in wastewater from Farmhouse

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The cultivation of microalgae using urban wastewater as a nutrient substrate represents a promising biorefinery concept that can serve multiple purposes; indeed, it allows for the generation of biomass, which can be used for various applications while meanwhile removing nutrients from wastewater. In this study, the potential of urban wastewater collected at two different time periods in a farmhouse as a nutrient substrate for microalgal growth was assessed. The wastewater samples were treated on a laboratory scale, inoculating reactors with two common species, *Chlorella vulgaris* (CV) and *Scenedesmus quadricauda* (SQ), and with an autochthonous strain of *Klebsormidium* sp. K39 (Kleb), directly isolated from effluents of the same system. The main aim of the study was to compare the microalgae's performances in terms of wastewater re-mediation and biomass productivity. In the first case study, which involved an effluent with a lower pollutant level, microalgal cultivation showed removal efficiencies in the range of 57–63% for total nitrogen, 65–92% for total phosphorous, 94–95% for COD, and 100% for *Escherichia coli*. In the second case study, involving an effluent with a higher pollutant level, the remediation performances of the three microalgae strains ranged from 93 to 96% for total nitrogen, from 62 to 74% for total phosphorous, from 96 to 97% for COD, and 100% for *E. coli*. At the end of the experimental trials, treated waters showed values of pollutants suitable for irrigation use, in accordance with environmental and national legislation, which established specific thresholds for irrigation purposes.

Presentation#32

Partial substitution of corn by almond, pistachio, or hazelnut skins in sheep diets: effect on rumen fermentation *in vitro*

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The replacement of conventional feedstuff with agro-industrial by-products could reduce the environmental impact of feed production and transport, and the feed-food competition. Nut skins are rich in fiber and unsaturated fatty acids and contain bioactive compounds, such as tannins, which could have beneficial effects on ruminant feeding. The objectives of this study were to verify if the partial substitution of corn with almond, pistachio, or hazelnut skins would not exert negative effects on rumen fermentation but could reduce protein degradation and CH_4 production. The experiment was carried out *in vitro* following a 3×3+1 factorial design: 3 skins [almond (AL), pistachio, and hazelnut (HZ)]×3 doses (7, 14, and 21g/100gDM), plus a control diet. The basal diet was formulated for lambs and in the treatments the corn was partially replaced by the skins. Gas production was measured and samples of CH_4 was took. Samples were also taken for volatile fatty acids (VFA) and ammonia and DM degradation was determined. Data were analyzed using a one-way ANOVA and adjusted with Bonferroni method. The treatments with pistachio did not show any significant results. When the replacement was made with AL, the effects were significant only at the highest dose. This reduced the production of methane (-22%) and total VFA (-15%). Hazelnut skins, both HZ14 and HZ21, were the ones that induced the most significant modifications. The lower gas production (-21%) was surely due to the lower CH_4 production (up to -29%). The total VFA decreased in these 2 treatments (-20%). In addition, HZ21 reduced the ammonia concentration (-14%). Low doses of nut skins can be substituted for corn without adversely affecting in vitro ruminal fermentation. To reduce methane production, it would be advisable to use AV or AL at higher doses, but this would reduce VFA production, a negative effect that requires further investigation.

Presentation#33

Effect of different formulations of lithium and acetoacetate on apoptosis of lung cancer cell lines

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Lithium is an element involved in a wide diversity of processes including fetal health and development. It is also used as a drug for bipolar disorder and it gains attention in cancer therapy. Acetoacetate (AcAc), one of the main ketone bodies produced following glucose deprivation, has recently received interest for its use in the treatment of tumors. AcAc is commonly used in the form of lithium or sodium salts. Different AcAc and lithium formulations, such as lithium AcAc (LiAcAc), sodium AcAc (NaAcAc), lithium chloride (LiCl) and lithium carbonate (Li2CO3), have been investigated as treatment or adjuvant of several cancer types but the studies result unclear and not convincing. Our study aims to compare in vitro the effect of different formulations of lithium and AcAc on the apoptosis of lung cancer cell lines and to determine the role of AcAc in the observed effects. We evaluated the apoptosis of the lung cancer cell lines A549 and PC9 induced by 10 µM ABT737 for 24 h, pre-treated or not with 5 mM LiAcAc, NaAcAc, LiCl or 2.5 mM Li2CO3 for 24 h. In these experimental conditions, the compounds had no effect on basal apoptosis of A549 and PC9 cells. As expected, ABT737 induced cell apoptosis of both cell lines. A pretreatment with NaAcAc did not modulate apoptosis induced by ABT737 in A549 cells but increased PC9 cell death. LiAcAc significantly decreased

apoptosis of PC9 cells. Interestingly, LiCl prevented apoptosis of these two lung cancer cells, while Li2CO3 significantly reduced apoptosis of A549 cells. Taken together, these results suggest that the effect observed using LiAcAc are independent of AcAc and can be attributed to lithium. This preliminary study needs further exploration but underlines the weakness in the potential therapeutic use of lithium and AcAc formulations in precise context, since it could be dependent, among other parameters, on the cell type.

Presentation#34

Addressing quality and sustainability in the organic durum wheat supply chain

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Food systems affect diets, human health, economic growth, environmental sustainability, and sociocultural issues. Cereal production plays a central role, significantly contributing to human nutrition, but seriously threatens biodiversity and ecosystem functions. This sector is experiencing several challenges, dealing with the increased exposure to environmental stresses, which affect both quality and yield performances, the lack of varieties specifically adapted to low-input farming conditions, and the maintenance of appropriate prices. In this regard, valorizing and exploiting landraces, old varieties, and evolutionary populations have been suggested to improve quality and sustainability along the related supply chains. The research here presented aimed at evaluating whether introducing durum wheat landraces and composite cross-populations (CCPs) under organic and low-input conditions can contribute to meeting the future needs of sustainable agriculture and improving human nutrition. The research activities have included: a) the evaluation of the main agronomic and quality performances of many durum wheat genotypes (14 CCPs and 2 control varieties, grown over the 2020-21, 2021-22, and 2022-2023 seasons at different Italian locations, under low-input conditions), according to specific standardized field, laboratory and statistical analyses; b) the assessment of the environmental impacts of the durum wheat production, through a *comparative* and *multifunctional* Life Cycle Assessment (LCA) study. The preliminary results documented statistically significant differences among the investigated genotypes in terms of productive performances and nutritional quality properties, as well as the urgency for mitigating the environmental impacts associated with the agricultural production of durum wheat. This allowed us to stress that, now more than ever, multidisciplinary approaches involving agronomists, breeders, ecologists, food technologists, and economists are needed to plan more sustainable and high-quality durum wheat production systems.

Presentation#35

Catastrophic weather events and the latent demand for crop insurance

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Extreme weather events are major causes of yield and revenue volatility in the agricultural sector. Subsidized crop insurance has a key role in buffering the adverse consequences of weather risks. The increasing occurrence of flood, drought, and frost events may drive latent changes in the value of crop production subject

to subsidized insurance contracts. We investigate these dynamics within the Italian risk management framework. We find a latent correlation between the incidence of catastrophic weather events and the level of subsidized crop insurance demand. Consistent with the structure of the Italian insurance market, this relationship tends to be stronger in Southern geographical areas and for spring-summer crops. These results suggest the importance of expanding and differentiating the supply of management tool to cope with weather risks.

Presentation#36

Eating time as a useful indicator in dairy farm management

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The increased use of advanced technologies in commercial dairy farms enables the continuous monitoring of individual cow parameters. The purpose of this study was to investigate the relationship between eating time, as measured by wearable sensors, and animal or management factors in commercial dairy farms. Data were collected from about 800 lactating cows of two breeds (Holstein Friesian – HF, and Italian Simmental - IS) reared on 14 dairy farms and distinguished by the presence of the same sensor validated for recording the eating times. Data about animals, feeding management, and ration characteristics were analyzed and statistical analysis was performed by grouping cows into five eating time classes. The two breeds were similar in terms of eating time, while rumination time was about 1 hour longer in HF (572 vs. 517 min/d). The yield of milk and energy-corrected milk grew as eating time increased. A similar trend was found for urea concentrations ($P<0.01$), while somatic cell concentrations tended to diminish ($P<0.05$) as well as BCS values ($P<0.05$). Rumination time values were higher in cows with longer meal intervals ($\geq$ 301 min/d). This study revealed that eating time appears to be well related to several productive and management traits of lactating cows, and its relationship with feeding efficiency merits further examination. For this purpose, a second investigation was conducted involving about 350 IS dairy cows reared on five commercial dairy farms. Data about performance, feeding management, health status, and farm environmental conditions were collected for one year in order to assess how eating time behaves during lactation and what factors can influence it.

Presentation#37

New approaches for sustainable soil and water agricultural management

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The adoption of new agricultural practices is essential for the rational management of the crop system and for making the crops more resilient to external stresses due to climate change. In this sense, the combined use of soil and water conservation practices can contribute to achieve sustainable crop production objectives and environmental benefits. This research project is focused on citrus groves cultivated under different soil management (SM, bare (B) and/or organic mulched (OM) soil) and water regime (WR, full irrigation (FI) and/or regulated deficit irrigation (RDI)). The specific objectives are: (i) to improve crop water use efficiency;

(ii) to identify innovative protocols to monitor the soil-plant-atmosphere (SPA) *continuum* relationships; and (iii) to evaluate the impact of the proposed practices on soil respiration (SR) fluxes using *ad hoc* accumulation chambers. An average water saving of 16% was obtained in RDI compared to FI in the irrigation seasons 2021-

22. The multivariate statistical analysis of the stem water potential values highlighted significant differences in 2021 related to the day-of-the-year (DOY) and WR, with average values of -1.72 (FI) and -1.82 (RDI) MPa. In 2022, differences in crop water status are due to the DOY and the interaction between DOY and SM, with average values of -1.72 (B) and -1.82 MPa (OM). Significant differences were found in SR as a function of WR and in the interaction between SM and DOY. A direct correlation was found between the SR fluxes and the organic mulching thickness (R^2 of 0.81). Future outlook of this research activity will assess the impacts of the proposed agriculture management practices on the SPA variables and to quantify the sources of uncertainty related to the SR tools.

SHORT PRESENTATIONS

(Wednesday, September 27, 2023)

Poster#1

Exposing Foggia's Hidden Habits: Wastewater-Based Epidemiology Sheds Light on Illicit Drug Consumption

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Wastewater-based epidemiology (WBE) is a well-established and complementary approach for determination of urinary biomarkers in wastewater during recent years. It is a promising tool for monitoring the consumption of illicit drugs in a population and for comparing local and temporal trends. In this study, illicit drug consumption levels were investigated for the first time in Foggia (Italy). A solid-phase micro-extraction method was applied to raw and treated wastewater samples collected from wastewater treatment plants in Foggia, Apulia region of Italy. Solid-phase extraction recovery and repeatability experiments were achieved by spiking the mix solution to different concentrations in tap-water and wastewater samples in replicates. The analysis of targeted illicit drugs has to be carried out simultaneously and with the same analytical conditions. Liquid chromatography-tandem mass spectrometry (LC-MS) analysis was conducted. Method validation was performed by determining limit of detection (LOD), limit of quantitation (LOQ), recovery, sensitivity, and precision. According to previous analyses conducted in other cities, cannabis is expected to be the most abused illicit substance in Foggia, considering both the mean consumption of illicit drugs and their statistical variations between weekdays and weekends. To the best of our knowledge, till now no data about illicit drug consumptions related to Foggia have been reported. WBE information would be helpful to implement and evaluate measures for reducing drug abuse and preventing the related health risks.

Poster#2

Unlocking complexity: exploring genomes with third generation sequencing and T2T assemblies

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As our case shows, telomere-to-telomere (T2T) assemblies can be achieved by using third generation sequencing technologies. We assembled the genome of the quasi-homozygous grapevine line PN40024, and the highly-heterozygous variety Cabernet Franc. PacBio HiFi reads and ONT long-reads were used to assemble de novo the genomes. Methylation profiles were also calculated for Cabernet Franc using the information included in ONT long reads. Seventeen out of 19 chromosomes of the quasi-homozygous line were reconstructed T2T, eight of which consisted of a single T2T HiFi haplotig. The remaining two chromosomes

were incomplete at one of their ends, , due to the presence of large gene clusters of ribosomal RNA. For the heterozygous variety, 31 out of 38 haplotypes were reconstructed T2T, 10 of which were composed of a single T2T haplotig. Thanks to the completeness of the reference, we managed to assemble regions that were previously unexplored, such as centromeric regions. These regions are composed of several repeat families, forming in some cases megabase arrays of tandem repeats, intermixed with retrotransposons mainly belonging to the Athila and the chromovirus-domain containing Gypsy elements. The methylation state information, carried by ONT long reads, suggest that these regions are highly methylated, especially along the arrays of the most common repeat.

Poster#3

Agronomic Strategies for Sustainable Cotton Production

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Cotton, with an area of 31.92 million hectares in around 80 countries worldwide and an estimated annual turnover of $5.68 billion, represents the most important natural textile fiber produced in the world. However, many cotton-producing countries have abandoned sustainable production practices to maximise yields, leading to severe environmental consequences. This study provides a systematic literature review of original research articles on sustainable cotton cultivation to identify and suggest proper agricultural strategies to be applied within different climate regions to embrace environmental consciousness. Firstly, the review explores the use of mycorrhizae as a valuable means to reduce the excessive use of fertilizers, reporting how the inoculation of selected species such as *Gigaspora margarita, Funneliformis mosseae* or *Acaulospora scrobiculata*, and their combined use can increase cotton root exploration and, as a consequence, biomass and nutrient uptake. Secondly, using cover crops belonging to grass, legume, and brassica species as an alternative to monoculture and fallow crop rotations was evaluated. Grasses, such as *Triticum aestivum*, provide high biomass and reduce nitrogen losses, while legumes, such as *Vicia villosa*, in addition to fixing N, also keep it available to the plant. Brassica species, like *Brassica carinata*, release allelopathic substances useful for sustainable weed management in cotton cultivation. Thirdly, studies on cotton water management have been reviewed, allowing the identification of a high potential for saving water resources. Despite furrow and sprinkler being the most used irrigation systems, the authors highlighted the advantages of drip and mulched drip irrigation systems regarding water conservation and cotton production. This systematic literature review, comprising various farming practices adopted in different climate zones, provides a guide for farmers toward eco-friendly cotton agricultural management without sacrificing productivity and highlights several aspects to be investigated through specific research to support cotton cultivation in the Mediterranean environment.

Poster#4

Technological strategies for food waste and loss valorisation through innovative food products design

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Global food waste and food loss represents a social, environmental, and economic challenge. On the other hand, the increasing food demand is compelling the agro-food industry to exert unsustainable pressure on natural resources, such as soil, air, water, and biodiversity. Especially livestock, being meat the main protein source adopted in the developed countries, is the primary pollution cause in the food system; even more, it cannot assure the protein requirement of the global population due to its excessive costs. Also, meat supply as the preeminent or exclusive protein source is recognized among the primary causes of cancer. In view of these challenges, the research of new sources of nutrients, especially with a high protein content, sustainable and healthy, is among the main priorities of food system strategies. This PhD project promotes technological strategies for sustaining the reuse and recycling of vegetable-based food waste and loss (FWL) and by-products as alternative sources of proteins with the aim to contribute in reducing the pressure of the current food system on the environmental, social and economic impacts. Food loss and waste will be selected based on their nutritional and functional characteristics, also evaluating local by-products. Among these, canola - the oil extraction residual of the seeds - and the okara - the by-product of the soymilk and tofu manufacturing - will be considered and utilized for their interesting nutritional content and potential techno-functional properties. For these and other FLW and by-products, emerging technologies, such as 3D food printing and friction cooking, will be adopted to obtain uncommon highly appreciated food products.

Poster#5

Epidemiological investigation of Shiga Toxin producing *Escherichia Coli* (STEC) in wild boars hunted in Apulia region

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The population explosion of wild boar is causing new public health issues to emerge. In fact, while wild boar meat reaches an increasing number of consumers, there is evidence that wild boar is a reservoir of numerous infectious diseases. In order to carry out a careful analysis of foodborne risk related to a given matrix and pathogens, prevalence data are needed to be properly evaluated; at present, data are scarce and fragmentary. Wild boar is capable of disseminating bacteria with characteristics of antimicrobial resistance, including resistance to antimicrobial molecules used in human therapy for the treatment of difficult-to-treat infections, such as infections sustained by microorganisms resistant to colistin and traditional and latest generation beta lactams. Based on these assumptions, the aims of the present study are: i) To perform a biomolecular survey by rectal swabs from wild boars shot during two consecutive hunting seasons in the Apulia region to assess the prevalence of STEC by the detection of the genetic virulence markers *stx1, stx2, eae*. ii) To characterize isolates of *Escherichia coli* by biomolecular assays for the assessment of Anti Microbial Resistance (AMR) pattern with a focus on colistin and beta lactams antibiotics resistance. The data obtained will help to provide a clearer epidemiological picture regarding the circulation of an important food-borne pathogen (STEC) that has often led to outbreaks in our region. These data, combined with those on the circulation of *E. coli* AMR strains may be useful to the institutional decision makers for the implementation of possible preventive measures to contain the phenomenon and reduce its impact on public health. Also, stabilization treatments will be studied and the shelf life will be estimated for both the new ingredients and the end-products.

Poster#6

Exploitation of probiotic strains with targeting cholesterol reduction for the formulation of functional food

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Nowadays, the food industries have focused on global probiotic market, with the aim to exploit bacteria with probiotic features. Among probiotic properties, bacterial cholesterol-lowering activity, attracted great interest for their potential role in regulating human cholesterol metabolism. Cholesterol-lowering property is strictly correlated with the bile salt hydrolase (BSH) activity, which plays a key role in reducing cholesterol absorption into the intestinal lumen, with a decrease of cholesterol blood levels. The aim of the present study was to evaluate the ability of several bacterial strains to deconjugate BAs, to develop a novel functional food with hypocholesterolemic effect. In this study, 66 potential probiotic bacteria, isolated from both food and human origins, have been investigated for their ability to deconjugated taurodeoxycholic acid (TDCA) and glycodeoxycholic acid (GDCA). The test has been performed through a direct qualitative plate assay, using modified MRS supplemented with BAs. An overnight culture of each strain has been inoculated into MRS-TDCA and MRS-GDCA plates, and a bile acid precipitate around the colonies was observed, indicating BSH deconjugation. Thirty of the tested strains showed a positive reaction against the two BAs. In details, 24 strains have resulted positive against TDCA, 4 strains against GDCA, and only 2 strains have deconjugated both TDCA and GDCA. The deconjugation of bile salt hydrolase, was revealed by the presence of an opaque halo around the inoculated strains or by the formation of opaque granular white colonies. The qualitative plate assay could be considerate a good preliminary *in vitro* test to evaluate the BSH activity of bacterial strains, to select strains with promising cholesterol reduction activity.

Poster#7

Title: Up-cycling of Plastic Waste into Valuable Products through Microwave Assisted Co-Pyrolysis with Biochar from Residual Biomass

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Plastic pollution has become a pressing global issue, with most of the plastic waste worldwide going unrecycled, amounting to less than 10%. Pyrolysis can efficiently convert plastics into solid carbonaceous materials, oils, and syngas, a gas mixture of CO and H_2 thus contributing to the release of a circular economy and reducing the emission of greenhouse gases (GHG). Hydrogen (H_2) has been defined as a clean energy carrier for its zero-carbon nature. Plastics has been shown to be a valuable feedstock for H_2 generation, and great efforts have been devoted to the catalyst and device development. However, conventional pyrolysis faces limitations in achieving high hydrogen (H_2) purity. By providing rapid and efficient heating, microwave-assisted pyrolysis (MAP) enables better heat and mass transport, yielding different product compositions compared to conventional pyrolysis. In previous studies, the microwave pyrolysis of plastic in presence of graphite, used as microwave absorber, resulted in liquid products with high yields (79.2–81.1%). The aim of this research activity is to investigate the MAP as promising and challenging technology for plastic waste

conversion into valuable products, including H_2, liquid oils and solid carbonaceous material. Biochar achieved by conventional pyrolysis, operating at different temperatures and residence times, of local available raw biomass (by-products and residues from agriculture, forestry, and aquaculture activity) will be tested as both microwave absorber and catalyst for increasing the H_2 selectivity. By adopting these advanced technologies and waste up-cycling methods, we can move closer to a cleaner, greener future with reduced plastic pollution and enhanced resource utilization.

Poster#8

Effect of nanoplastics on *in vitro* bovine granulosa cells culture

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Plastic pollution represents a serious threat to humans and animals. Special emphasis must be paid to farm animals. As they produce food such as milk, eggs and meat, this poses the consequent risk of biological amplification along the food chain. However, many aspects still need to be investigated to clarify the pathophysiological consequences of exposure to micro- and nanoplastics in mammalian system, especially with respect to reproduction. Therefore, this study aims to investigate the effects of different concentrations (5, 25, and 75 µg/ml) of nanoplastics (NPs, 100nm, polystyrene) in an 8-day serum-free bovine granulosa cell (GC) culture used an in vitro reproductive cellular model. While current research on the effect of plastics particles on GCs is based on a short-term culture, the 8-day in vitro culture model is more comparable to the in vivo situation, offering the opportunity to understand how cell viability, steroidogenic activity and cytokine production can be influenced by NPs. To test the viability of bovine granulosa cells, the MTT assay was performed. Results revealed a statistically significant decrease in GCs viability upon treatment with NPs, except for the highest concentration (75 µg /ml) that was not significant. Compared to the control (C), the viability (mean ± SEM) was 89.16% ± 6,26% ($p<0.05$) and 84.37% ± 5.75% ($p<0.001$) for 5 µg/ml and for 25 µg/ml of NPs, respectively. These preliminary data may provide initial insights about the decline in viability of the GCs. Since little is known about the future impact of NPs, further studies, especially related to steroidogenesis and inflammatory status, are needed.

Poster#9

Microbial Biotechnologies for Sustainable Management of Food Products

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The present Ph.D. project aims to contribute to developing model pathways for innovation that showcase the potential of microbial biotechnologies as a driving force for promoting sustainability within food systems. The principal target of the activities is the design of plant-based fermented foods, including dairy-like products, improving the sensory, nutritional, and functional quality and safety standards. The investigation and formulation of improved, fortified and functional fermented staple foods and innovative beverages through tailored microbial biotechnologies in order to limit ultraprocessing in the field of plant-based products represent a milestone. The project's priority is also the isolation, characterisation, and conservation of microbes

associated with new food niches and traditional fermented products, also proposing original strategies to assist the production of starter cultures. Constant attention will be dedicated to the consumer-oriented attributes and to addressing the innovative demands of industries (in terms of enhancing the added value of traditional foods and beverages, supporting new product development, and promoting the reuse of waste/by-products through low-input technologies). In general, the valorisation of microbial diversity, in particular of lactic acid bacteria, for the development of 'nature-based' solutions for the food systems is in line with principles of social (promoting functional and bio-fortified foods, label cleaning, ensuring food safety), economic (realising product and process innovation, boosting Geographical Indications), and environmental (biodiversity preservation/valorisation, low-input processing) sustainability. The potential of cross-over strategies to use microbial resources from a traditional fermented product to a new pattern in order to develop new fermented foods and beverages is also emphasised. This can also be a suitable strategy for exploiting the latent biotechnological potential associated with previous isolation and characterisation studies of bacteria, yeasts, and filamentous fungi from spontaneous fermentations. Through this approach, in addition, the intrinsic value of raw materials is enhanced a bridge between traditional fermented products and innovative fermented products. Finally, the potential of fermentation and microbial-based biotechnologies in the sector of agri-food as 'mitigating agents' against the effects of global changes is also discussed.

Poster#10

Promising legumes integration on milk production and welfare

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This case study aims to evaluate the efficiency of integrating sheep grazing with legumes by assessing sheep welfare conditions, milk yield, and milk quality. The integration of legumes into sheep grazing systems has gained significant attention due to its potential benefits in improving forage quality, increasing animal productivity, and reducing reliance on external feed sources. The study will be conducted over a specified period, involving a group of sheep raised in a grazing system that incorporates legumes into their diet. Most promising legumes known for their positive impact on milk production and animal welfare are: *Hedysarum coronarium* (Italian sainfoin), *Medicago sativa* (Alfalfa), *Trifolium pratense* (Red clover), *Trifolium repens* (White clover), *Lotus corniculatus* (Birds foot trefoil), *Vigna unguiculata* (Cowpea), *Glycine max* (Soybean). A control group will consist of sheep grazing on traditional forage without legume integration. Parameters related to sheep welfare conditions, milk yield, and milk quality will be monitored and compared between the two groups. The milk samples of sheep under different feeding treatments will be collected for evaluating of physio-chemical characteristics. Fat, Total Solids, SNF and Body Weight of sheep will be evaluated to assess welfare conditions, parameters such as body condition score, growth rate, and health indicators will be evaluated. Milk yield, fat content, protein content, and somatic cell count will be assessed. Additionally, feed costs and overall profitability, will also be considered. Data collected will be analyzed using appropriate statistical methods to determine any significant differences between the two groups. Findings will have practical implications for farmers and livestock producers interested in optimizing their grazing systems. Understanding the benefits and challenges associated with integrating legumes into sheep grazing can inform

decision-making processes and promote sustainable and efficient livestock production systems with a reduction of ruminant emissions.

Poster#11

Exploring public acceptance of Nature-Based Solutions (NBS) in marginal areas through participatory methods: a view from the Simeto Valley inner areas in Italy

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In Europe, the main challenge is the increase in territorial inequalities (social, economic marginalization, and environmental imbalances) and in Italy, this dimension is particularly evident (Barca, 2009 and 2012). The National Strategy of Inner Areas (SNAI), launched in Italy in 2014, has the dual objective of improving the quantity and quality of general interest services and promoting development projects that enhance natural and cultural heritage (Faludi, 2006, European Regional Development Fund 2014-2020). The inner areas have been identified through indicators that highlight the absence or distance from essential services (education, health, mobility), also related to environmental and cultural resources. The Nature-based solutions (NBS) can be suitable for inner areas, especially when referring to the increased environmental fragility of abandoned areas, because they aim to conserve and strengthen environmental resilience, promote sustainable resource management, and foster local economic development by reclaiming abandoned areas. Indeed, Nature-Based solutions promote alternative solutions or integrate them with traditional infrastructures to adapt and mitigate the impacts of climate change, preserving biodiversity, and improving human health and wellbeing (Cohen-Shacham et al., 2016) providing environmental, social, and economic benefits (European Commission, 2016a). So, the main goal of this study is to evaluate the local community's perception and acceptability of Nature-Based Solutions in an Inner Areas selected as a place-based case study, the Simeto Valley in Sicily, Italy, in order to provide a theoretical-operational framework for the reduction of territorial marginality factors strictly dependent on environmental fragility. This will be achieved through a multi-method approach combining secondary data analyses and questionnaires, and qualitative methods including fieldworks and participatory methods which will allow the identification of key themes and the dimensionalization of their informative content (Sandelowsk, 1995) by the different local actors with the aim of activating a real change in this marginalized area.

Poster#12

Insights into the genetic and epigenetic regulation of bud dormancy and deacclimation in grapevine

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In grapevine, phenological development and survival from year to year are strongly affected by seasonal changes and environmental stimuli such as temperature. Grapevine varieties show different responses to environmental signals, but many have genetically adapted for growth in specific geographical regions, making this diversity not sufficient to successfully respond to rapid and extreme environmental changes. Among phenological stages, bud development is strongly affected by temperature changes. Due to climate change,

higher temperatures are recorded in winter, leading to early dormancy release and budbreak. In turn, this phenomenon causes a premature exposure of vulnerable tissues to adverse conditions, increasing the damage due to late frost events and negatively impacting bud development and survival. Dormancy and budbreak are complex traits under the control of multiple genes and, in addition, they exhibit variability among grapevine varieties: understanding the molecular determinants underpinning these physiological processes is therefore essential to select or produce genotypes better suited to the changing climate. Previous transcriptome studies highlighted the reactivation, during budbreak, of genes involved in epigenetic processes. In the project, complementary approaches such as transcriptome, methylome and histone modification analysis will be performed on buds at different developmental stages in order to characterise the landscape of genetic and epigenetic changes triggering budbreak, and to relate them to the observed variability between early- and late-budbreaking varieties. An experimental approach involving the use of single-bud cuttings will be developed in order to overcome field variability. In addition, new gene-editing and regeneration protocols for the production of transgenic plants will be tested for their future application in the characterization of novel molecular determinants.

Poster#13

Resilience to arid climate, nutritional benefits, and techniques for sustainable cultivation and multifunctional utilization of local genotypes of fruit species in marginal inner areas.

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According to the National Strategy for Inner Areas (Barca, 2014), improving the sustainable aproach to agriculture is crucial to support the inland rural areas in tackling problems such as those posed by the current climate crisis with global warming and water depletion, and by biodiversity loss, which contribute significantly to farm decline and population decrease in mountain areas. The European Commission's "Farm to Fork" strategy (European Union, 2020) highlighted the need to accelerate the transition towards a sustainable, fair and healthy food system. Among the agricultural sectors, fruit growing of inner areas has local traditions based on ancient cultivars, generally rustic and well adapted to difficult environmental conditions, which therefore represent a resource to increase the resilience of agriculture to the climate crisis, reduce the demand for productive inputs and preserve genetic diversity. The aims of this PhD project are: i) to explore the ecophysiological biodiversity of local genotypes and their response to stressing conditions; ii) to investigate fruit quality traits of the most interesting genotypes, with emphasis on bioactive compounds and nutritional benefits; iii) to evaluate antimicrobial potential of fruit extract; iv) to adapt growing techniques making them more innovative and sustainable, including the use of microbial biostimulants and PGPR's; v) to introduce monitoring systems for the precise assessment of orchard water consume in marginal inner areas, according to point 12.2 of the "Agenda 2030" aimed at sustainable management and efficient use of natural resources. The research activity is supported by Dottorati Comunali (Agenzia per la coesione territoriale, Consiglio dei Ministri) and by the projects AGRITECH (MUR, CN_00000041) and VALMELA (PSR Regione Puglia 2014/2020, S.M. 16.2, DDS 94250037358).

Poster#14

Engage a new generation of good farmers for building a resilient agricultural system

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A lack of young people in agriculture is widely considered a weakness for ecological and multifunctional transition as well as for successful and innovative farm business management. Statistical data confirms the shortage of youth engaged in agricultural careers and, at the same time, the records show higher profitability of farms led by people under 40 than those led by the previous generations. Stimulating a generational turnover in agriculture is crucial for promoting the resilience of the sector. Farm resilience refers to the ability to withstand and recover from various stresses, shocks, and disturbances while maintaining the final desired outcomes. From this perspective, it is as important to encourage young people into the sector as it is to train a new generation of good farmers. The concept of the good farmer as an analytical category seeks to understand socio-cultural and factual factors that influence youth's behaviour in the broader context of agrarian change. The European Union has implemented incentives and subsidies to foster the process of generational and ecological transition under the Common Agriculture Policy (CAP). Nonetheless, the outcomes did not meet the needs, and support for generational renewal of the nine CAP objectives for the 2023-2027 program, along with other key and resilience-related goals. The research project aims to provide a comprehensive view of the factors that interfere with the changeover process. Starting with the theme of young people's perceptions and aspirations for agricultural careers, the PRISMA model was applied to review studies over the last 10 years. The results revealed key elements influencing the youth's decision to become a farmer, grouped into four main clusters.

Poster#15

Comparison of Desalination Technologies and Assessment of Their Sustainability

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Water scarcity has become a significant issue in socioeconomic progress and a threat to livelihood in an increasing number of countries. In many places around the globe, overexploitation of freshwater resources threatens not only food security but also maintaining sustainable water usage. The maximum global capacity for consumptive freshwater use is expected to become even more challenging soon due to increasing population pressure, changing water consumption behaviors, and climate change. In this regard, countries all over the world have been looking for and researching new ways of ensuring the long-term availability of sustainable drinking water sources, such as desalination. Desalination capacity has recently grown significantly, rising from 35 million m^3/day in 2005 to 115 million m^3/day in 2020. Several technologies have been proposed during the last decade. They can be classified into two primary categories: thermal technologies, which are mainly heat-consuming, and membrane technologies, which require electrical energy. The thermal technologies include Multi-Stages Flash distillation, Multi-Effect Distillation, and Mechanical Vapor Compression, whereas the membrane technologies include Reverse Osmosis, Electrodialysis, and Forward Osmosis. However, all these technologies are energy-intensive and can have significant environmental

impacts. In this context, sustainable desalination technologies such as hybrid desalination and solar desalination, are essential in solving this issue. They aim to improve energy consumption and water recovery, reduce brine discharge and greenhouse gas emissions, and provide a reliable and cost-effective source of freshwater. The main objective of this research is to compare the different desalination technologies, focusing on their energy consumption, cost, and sustainability, and to study the feasibility of integrating renewable energy, particularly solar energy, into the desalination process.

Poster#16

Use of liquid nitrogen to preserve the antioxidant activity in pistachio skin

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Emerging studies suggest that consumption of nuts might confer beneficial effects on human health. Although authors focused the research on the monounsaturated fats content, recent studies indicate that phytochemicals present in pistachio peels (skins), including polyphenols, may also play an important role on human health. For most of their uses, pistachio nuts are used after skin removal, which represent about 10% of the total weight. The traditional peeling process of pistachio is done by hot water (90-95 °C), where there is a worsening of the quality of the product, mainly related to the lipid oxidation and loss of anthocyanins and chlorophylls. Moreover, from traditional peeling process a huge quantity of peeling water, considered as a waste, is produced. The aim of the present work is to use Liquid Nitrogen (LN) as alternative peeling method for pistachio nuts. The skins were extracted through methanol (M50%) and an organic mix solvent (OMS). Results show that antioxidant activity in skin obtained from the LN peeling method was significantly ($p > 0.05$) higher than that obtained from the traditional peeling method (18.91±0.20 against 11.83±0.09 mg TE/g of dry sample considering the M50% extracts, and 27.21±0.71 against 19.37±0.07 mg TE/g of dry sample, considering the OMS extracts). Furthermore, pistachio kernels treated with LN evidenced better humidity, peroxide number and colorimetric parameters, evaluated with CieL*a*b* method. The comparison between the two peeling methods showed that LN could preserve the quality of pistachio seeds also in terms of antioxidant activity of the skin. Skins could be employed as a functional ingredient in food formulations, in a circular economy perspective.

Poster#17

Ecophysiological response of maize (*Zea mays*) to water stress: remote sensing and *upscaling* techniques for a more efficient management of water resources in agriculture

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One of the most relevant effects of global change is the alteration of hydrological events, which affects many human activities, including agricultural ones. Understanding how maize (*Zea mays*) – one of the most important crops worldwide – responds to these modifications is important to adapt to climate changes. In this framework, remote sensing could bring an important improvement: satellite- and drone-acquired data can be very informative and, together with physiological markers of plant stress, could improve our understanding of

the effects of climate change on this key aspect of human lives. Moreover, maize edibility depends on the absence of mycotoxins in the grain, which are produced by some fungal pathogens such as *Fusarium verticillioides* and *Aspergillus flavus*, whose presence and capacity to produce mycotoxins depend on environmental conditions, mostly on precipitations and temperature. Therefore, the final aim of this project is to better understand how the environment affects the physiology of maize in the field, and eventually how this affects the presence of mycotoxins in the grain. To investigate these relationships, in 2022 some drone-acquired multispectral data, physiological markers of plant stress and mycotoxin presence in the grain, have been gathered in maize fields in NE Italy on a spatial survey in different soils characterized by different agronomic and irrigation conditions. The same setup has been reproposed in 2023, and the experiments are ongoing. The expected results are some new insights into the interplay between the environmental conditions, the physiology of maize, the presence of pathogens, and eventually the presence of mycotoxins.

Poster#18

The regional ecological network and functional agroecosystem biodiversity: spatial strategies and nature-based solutions

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The objectives of the project take into account the Natura 2000 network and propose the promotion of High Nature-Value Farmland (HNVF), a sustainable management of both agriculture and forestry. The study area includes some of the most important components of the Regional Sheep Track System (RST) and of the Regional Ecological Network (RER), corresponding to some stretches of the two main watercourses in the province of Foggia (Candelaro and Cervaro, respectively). The main lines of research are the following:

- Identification and monitoring of biodiversity (flora, fauna and land use), also through social involvement (i.e. *citizen science*);
- Innovative techniques for joint implementation of good forest and agricultural management practices;
- Dissemination of good practices and training of local stakeholders (farmers, foresters, etc.), together with the launch of participatory processes (e.g. River or Community Covenant).

The first photo-interpretation studies, accompanied by field verification surveys, allowed a preliminary naturalistic and agro-ecosystem classification. The area is mainly composed of herbaceous crops (wheat) and fragments of residual naturalness with a natural forming forest (19 ha of riparian forest with *Salix sp*. and *Populus sp.*) and an anthropic forestation (13 ha with *Eucaliptus sp*.). The expected results of the project include the development of a sustainable and joint planning model for the RER in combination with sheep tracks and watercourses, taking into account multifunctionality, the diversity of agro-ecosystems (grasslands and forests) and sustainability. The aim is to protect biodiversity while at the same time providing adequate resources for rural livelihoods (sustainable agro-forestry bio-economy).

Poster#19

Evaluating the impact of Carbon dioxide and high temperature on *Sitophilus granarius* infestation in stored wheat grains

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Global dietary protein source cereals like wheat face up to 30% post-harvest losses due to insect infestations during storage. To combat this challenge, modified atmosphere techniques (MAP) have emerged as a central strategy, adjusting oxygen, carbon dioxide, to manage pests, ensuring safety and sustainability. Being aerobic in nature, insects succumb to desiccation with elevated carbon dioxide. Higher concentrations of carbon dioxide can cause respiratory suppression, acid-base imbalance and mortality. Heat treatment is another effective method for controlling insect infestations in stored cereal grains by disrupting the biological processes and physical structures of the insects. Synergizing high temperatures and elevated carbon dioxide leads to higher pest mortality by disrupting metabolic processes. Hence, modified atmosphere techniques, heat treatments, and synergistic approaches present promising strategies for effectively managing pests in stored cereal grains. The forthcoming research will follow the path of inquiry that was started by a previous study at UNIFG, whose results indicated that carbon dioxide and higher temperature were most effective against adult and eggs. This study will analyze the combined toxic effects of carbon dioxide and temperature on different stages (especially larvae and pupae) of *Sitophilus granarius* in stored wheat grains. For this, infested wheat grains will be exposed to carbon dioxide (0 and 100%) and temperature ranges (45, 50 and 60ºC) for 3, 6, 12 and 21 days. Following this, the impact on different stages of insect will be assessed along with the effect on physicochemical and organoleptic characteristics of wheat grains. The collected data will be subjected to statistical analysis.

Poster#20

Territorial development of the SNAI area of "Calatino" and the role of the agri-food system

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The Calatino area experiences significant economic development delays, despite various implemented local development experiences over the years. Its primary sector, agricultural and agri-food production, struggles to maximize the quality of its products due to a lack of organisation and modernisation of business networks and supply chains. Additionally, inadequate marketing operations and management undermine its progress. This study focuses on the involvement of stakeholders in the agriculture sector, such as local councils, municipalities, trade associations, Local Action Groups (GALs), and the Experimental Graniculture Station. The primary aim of this research is to engage stakeholders in a participatory Delphi analysis process. This method enables the collection of viewpoints and ideas from different stakeholders, emphasizing their perceptions and difficulties. Subsequently, multivariate statistical analysis methods will be used to gain a comprehensive understanding of stakeholders' viewpoints and identify potential points of convergence. The analysis of various stakeholders' opinions will provide a comprehensive overview of the dynamics in the agricultural sector in the Calatino area and help identify critical points and opportunities for economic

development. The participation of local stakeholders is essential to ensure that the suggested strategy aligns with the requirements of the region and can garner extensive agreement. It is only through this collaborative participation that a sustainable direction can be delineated, which fosters a stable and comprehensive recovery for the Calatino SNAI area.

Poster#21

Environmental sustainability in dairy farms

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The concept of sustainability, defined for the first time in the Stockholm Declaration of 1972, has always been applied, in various ways until, between the 90s and 2000s were outlined three different pillars of sustainability: environmental, economic and social. Despite the interest in all the pillars of sustainability, the agri-food sector has always paid attention to environmental sustainability and mitigation measures for climate-changing gases which are mainly linked to animal production and land use. Being the third productive sector in terms of greenhouse gas emissions, the agri-food sector has a fundamental role in achieving the goals defined by the United Nations Organization (UN) for the reduction of climate change. The dairy sector contributes to 4% of all anthropogenic emissions and its main emissions is methane. For this reason, it is essential to assess how methane production vary not only according to the individuality of the animals, but also in relation to herd management and environmental conditions. For this purpose, two experimental tests will be carried out: the first test consists in measuring the amount of methane emitted during feeding, verifying the possible correlations with the quantity and composition of the milk produced, the composition and digestibility of the diet and the genetics of the animal. The second test will instead be aimed at quantifying the daily emissions of methane in relation both to the different behaviors of the animal and to the various stages of lactation. All tests will be carried out under PNRR M4C2, DM352/2022, in collaboration with the company "Le Tenute Marianis s.r.l." and with the support of the National Agritech Center, (NATIONAL RECOVERY AND RESILIENCE PLAN (PNRR) – MISSION 4 COMPONENT 2, INVESTMENT 1.4 – D.D. 1032 17/06/2022, CN00000022).

Poster#22

Strategies to overcome drought stress in Mediterranean environment: the case of ornamental plants

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Water scarcity is a problem that affects the Mediterranean environment and will be more pronounced with global change in the future. This problem, together with the high summer temperatures, determines drought stress, which is one of the main factors limiting the use of ornamental plants in Mediterranean environments. Appropriate plant selection and conditioning techniques are crucial for the establishment, survival, and subsequent growth of plants after transplantation under semi-arid conditions. Selecting ornamental plants with appropriate morphological and physiological characteristics to improve their tolerance to harsh environments is of utmost importance. Ornamental plants have adaptive mechanisms to overcome the negative effects of drought stress. The large number of species grown in the Mediterranean area offers the opportunity to select

some of them for ornamental purposes, with the ability to adapt to drought conditions. Plants that are tolerant to drought stress show different adaptation mechanisms to overcome this adverse condition, including morphological, physiological, and biochemical modifications. These responses include the root/shoot ratio increasing, growth reduction, leaf anatomy change, leaf size, and total leaf area reduction to limit water loss and ensure photosynthesis. Furthermore, drought stress influences photosynthesis and chlorophyll *a* fluorescence. Recent studies on the mechanisms of signal transduction and the development of drought tolerance in ornamental plants are useful for understanding the mechanisms of action. In this context, the research purpose is to deepen the knowledge of how drought may modify the morphological and physiological characteristics of plants and reduce the aesthetic value, which is the key parameter for the assessment of ornamental plants, and is useful for obtain a more sustainable landscape. For these reasons, different trials have been and will be carried out for identifying the tolerance mechanisms associated with drought stress and to identify functional strategies for the selection of suitable plant species.

Poster#23

The role of Medium Chain Triglycerides (MCT) oil and Ketogenic Diet in Obesity and Inflammatory bowel diseases: in vitro and in vivo experiments.

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Low-carbohydrate diets containing a very high percentage of fat and an adequate protein intake are called ketogenic diets (KD) due to their ability to stimulate the hepatic production of the ketone bodies acetoacetate (AcAc) and β-hydroxybutyrate (BHB), the body's physiological response to starvation. Some food products that are known to contain rich ketone body precursors are coconut oil and Medium Chain Triglycerides (MCT) oil. MCT oil consists only of MCTs, which are lipid molecules that are more readily absorbed and oxidized than most lipids. Stimulating ketone body production, such as butyrate has various beneficial effect on bowel health: it is the preferred energy source for colonocytes, maintains mucosal integrity, promotes satiety, and suppresses inflammation and carcinogenesis. In addition, data literature reports that there is a strong correlation between obesity and bowel disorders such as inflammatory bowel diseases (IBD). In the lights of these premises, the aim of this research is to elucidate the potential effects of KD enriched in MCT oil on obesity and colon inflammation and its possible technological application. In the first step, different colorectal cancer cell lines such as Caco-2, HT116, and HT29 will be treated with different AcAc and BHB concentrations and with a mix of MCT oil, and cell viability and cell migration. Will be evaluated the presence of AcAc and BHB receptors on different cell lines and will be evaluated different inflammatory pathways, to study the potential anti-inflammatory and antiproliferative effects of AcAc and BHB. Following, obese subjects with IBD, sex, and age were matched with a control group to evaluate, in vivo, the effects of KD based on foods enriched with MCTs from milk and coconut to research the technological application.

Poster#24

Sustainable valorization of sheep wool waste: new components for green buildings

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Today, the principles of environmental, economic, and social sustainability are becoming crucial. One of the sectors which mostly threatens the ecosystem is the building sector with high emissions, solid waste production, energy, and non-renewable resources consumption. This sector is looking for eco-friendly, renewable, and recyclable materials. It has been demonstrated that wool waste is the major responsible of several pollution problems due to its disposal but, at the same time, it can be successfully employed in the "green" building, as thermal insulation. The proposed research activities aim to evaluate the possibility of transforming this waste into resource by re-using sheep wool fibers for producing green building components. One application of such valorization is the "anti-rollover grids" with double role of thermal- acoustic insulator and anti-overturn material for rural buildings in seismic areas (e.g., Sicily). The first part of the research includes the whole process of transforming the greasy wool into anti-rollover grids including the mechanical and physical tests for developing a prototype comparable with other similar building components already present in the market. Still in the first part, the research proposes a new chain, through Geographic Information Systems, to localize suitable wool-waste collection centers as first step of the valorization process. In the second part, Life Cycle Assessment methodology will be applied to assess the sustainability of the whole process, comparing in terms of environmental impacts the production of alternative wool-based products. The achieved results could represent a first step to plan the sustainable re-use wool waste as natural, renewable, and biodegradable fiber in construction sector, providing the possibility of creating a new supply chain and solve the problem of its disposal.

Poster#25

A One-health approach: from feed to functionalized food

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Modern animal husbandry is increasing its focus in looking for eco-sustainable farming systems without neglecting the dairy yield and nutritional quality of milk and derivatives. The growing attention of the consumer towards products with nutraceutical properties, more sustainable and respectful of animal welfare represents an objective to be achieved. Appropriate measures aimed at improving both welfare and feeding techniques have already influenced the qualitative and functional characteristics of buffalo milk. The adoption of dietary plans useful for maintaining high levels of health-promoting molecules in buffalo milk represents a strategy to be pursued and enhanced. It has been seen that betainized compounds present in the diet and/or produced by gut bacteria may provide a key approach to guide the use of dietary management for type 2 diabets (T2D). The latter is often characterized by impaired homeostasis and multiple cardiovascular risk factors such as unhealthy metabolic profile and an increased allostatic load, an early step in the development of

cardiovascular diseases (CVD). This project aims to evaluate the efficacy *in vitro* and *in vivo* of functionalized buffalo milk in reducing the dysfunction of patients with T2D. In particular, the investigation on different metabolic hormones, sexual hormones and hormones of the hypothalamic-pituitary-adrenal (HPA) axis and their threshold values could provide also precious information regarding the allostatic load and the patient's coping ability with different stressors linked to the pathology and diet restrictions. Biochemical and endocrine parameters will be assayed by enzymatic colorimetric methods and by immunoassay on punctual and retrospective matrices.

Poster#26

Identification and evaluation of the biological activity of semiochemicals for the monitoring and control of olive tree moth, *Prays oleae* (Bernard), and cotton bollworm, *Helicoverpa armigera* (Hübner)

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Chemical cues play a crucial role in inter- and intra-specific communication in insects. Semiochemicals are natural compounds regulating many aspects of insects' life including reproductive behaviour and localisation of suitable oviposition and food sites. The identification and application of insect semiochemicals is one of the most promising research areas for the development of sustainable control strategies of insect pests. In fact, insect semiochemicals can be applied both as indirect (monitoring) and direct control means (mass trapping, attract and kill, mating disruption, male disorientation). To design an increasingly safe and environmentally friendly food supply chain, the New Green Deal of the Farm to Fork section of the European Commission aims to significantly reduce the use of synthetic chemical inputs by 2030. New sustainable control tools of olive tree moth, *Prays oleae* (Bernard), and cotton bollworm, *Helicoverpa armigera* (Hübner), respectively among the most damaging pests of olive trees and processed tomato, are urgently needed due to recent legislation limits on the use of synthetic insecticides. The Ph.D. research program aims to identify and develop effective applications of *P. oleae* and *H. armigera* semiochemicals to be used for pest monitoring and direct control by mating disruption technique. Research activities will be carried out in collaboration with the partner company CBC Europe - Biogard division. Proper blends of bioactive compounds and their formulations will be characterised and optimised by electrophysiological, chemical, and behavioural investigations whereas their effectiveness will be evaluated in field studies.

Poster#27

Phytopathogenic fungi vectored by invasive bark and ambrosia beetles and approaches for their sustainable management

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In the last years, Mediterranean regions have been invaded by several alien wood-boring beetles among which the majority are species native to southern Asia or North America. Bark and ambrosia beetles (Coleoptera:

Curculionidae) are receiving increasing scientific interest because of the economic losses that they can cause in invaded areas. However, because of their inconspicuousness, taxonomic confusion, and/or misidentification, some bark beetle invasions have been overlooked. In the Mediterranean environment (i.e., Sicily, Italy) heavy infestations by *Cryphalus dilutus* (formerly identified as *Hypocryphalus scabricollis*) have been reported for common fig (*Ficus carica*) in 2014 and 2015. During 2021 and 2022, severe infestations by a bark beetle species belonging to the tribe Cryphalini were observed also on mango (*Mangifera indica*) for the first time in Europe. Based on this evidence, we first aimed to clarify the identity of the bark beetle species attacking both mango and common fig in the study area. Then, fungal pathogens that can be vectored by the beetle species on both host species have been morphologically and molecularly characterized. Our results revealed that the bark beetle species attacking both mango and fig trees is *Cryphalus dilutus* and that different fungal pathogens are associated, i.e., *Botryosphaeriaceae* spp., *Ceratocystis ficicola*, and *Neocosmospora* spp. More research is needed to clarify the ecological role of these beetle-fungi associations also in other host species. Finally, further research is needed to find innovative and sustainable tools (e.g., micro- and macro-biocontrol agents, selective chemicals, etc.) with the aim of preventing beetle attacks and/or to reduce the severity of the associated fungal diseases.

Poster#28

Use of Plant Growth Promoting Bacteria on Mediterranean crops: a preliminary study on wheat

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The goal for modern agriculture is to find sustainable solutions for optimization of crops. Sustainability is also goal and a challenge for Agritech (Agritech National Research Center), and the research activities here by reported are a part of this project (task 6.1.1). The adoption of Plant Growth-Promoting Bacteria (PGPBs) is the most promising approach to achieve these targets. PGPBs are defined as "plant bio-fertilizers" that can stimulate nutritional processes and plant growth through direct or indirect mechanisms on some crops, including durum wheat, although most studies have been done in growth chambers. Many times, a challenge is strain survival and their ability to prevail and modulate soil microbiota. Thus, the aim of this research was to study the ability of some selected PGPB strains to persist and survive in soil when used as biofertilizers, as well as their impact on soil microbiota and biodiversity. This research focuses on the use of a wild strain (isolated and characterized by the researchers of Predictive Microbiology Lab, University of Foggia) as well as on some commercial bio-formulates, used on wheat in a field trial. The results suggest the ability of PGPB to modulate soil microbiota, reducing some taxa, as well as to prevail and to survive in soil, thus contributing to significant changes of the microbiological scenario of soil.

Poster#29

Vitis vinifera L. cv Cabernet Sauvignon and Grenache under different water regimes and nutrient availability: a physiological and molecular study

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Climate change is expected to provoke an increase in the frequency and intensity of drought events and water scarcity that will have detrimental effects on photosynthesis and plant yield. To sustain an appropriate plant yield under sub-optimal conditions, a common practice is the application of high amounts of fertilizers with negative environmental consequences. The present study aims at evaluating the interplay between water and nutrient availability, namely nitrogen (N) and potassium (K), in two grapevine cultivars with a different sensitivity to water shortage stress. Two-year-old *Vitis Vinifera* cv. Cabernet Sauvignon and Grenache grapevine plants grafted on SO4 rootstock have been transferred in pots under semi-environmental conditions. During two consecutive growing seasons, plants will be either maintained well-watered (100% ETc) or subjected to a controlled water deficit irrigation (33% ETc). Moreover, different N:K fertilization doses will be applied: 100%N:100%K, 100%N:30%K, 30%N:100%K and 30%N:30%K. Several morphological and physiological parameters will be measured, such as plant growth rate, water potential, photosynthetic rate, and stomatal conductance. In addition, multi-element analysis at the canopy level will be implemented by collecting leaves at flowering, veraison, and maturity stage. Results deriving from the experiment will provide an integrated characterization of the differential response to the single and combined deficits of the two cultivars selected. These results will be useful to find new strategies to increase the sustainability of grapevine cultivation under stressful environmental conditions by optimizing both water use and nutrient acquisition efficiency.

Poster#30

A statistical model for the characterization of agro-food waste: an exploratory study

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Human population is increasing every year and consequently the need for goods and services, and the associated waste and refuse. The current practices used for waste disposal are time wasting because of an inefficient categorization method, thus it directly affects company costs; furthermore, in many cases they cause considerable environmental damages. This research aims at proposing solutions which can improve the current situation of waste management through a mathematical statistical model, based on microbiological, chemical, and physical indices which can reduce the time taken in waste disposal and the economic efforts of companies. It will support stakeholders in speeding up categorization operations and thus reduce costs related to taxes, management and disposal of waste produced. As a first part of this project, microbiological, chemical, and physical parameters was analysed starting from ten different real matrices like wasted lands by anthropic activity and the

extrapolated parameters will be the core of the statistical indices of the model. At present, the available results are on the microbiological profile of ten different soils polluted by anthropic activity, with the following outputs (average values): *Pseudomonas* spp. ($9.40*10^6$ CFU/g), actinobacteria ($4.09*10^6$ CFU/g), clostridia ($1.35*10^2$ CFU/g), and aerobic bacteria ($3.53*10^6$ CFU/g). Future steps of the work will comprehend chemical and physical analysis on the 10 soil samples to find correlations among all the parameters to choose the right indices for statistical model. The information acquired in the first phase will be the background of the second part of this work, during which a virtuous model of circular economy will be identified to reuse and recycle wastes. The expected main objective of the project is a holistic model of efficient management of the entire waste cycle, from upstream to downstream, enabling stakeholders to recover resources in an environmentally friendly way.

Poster#31

Use of Microalgae for sustainable and regenerative agriculture

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The identification of methods to improve the quantity and quality of crops is being investigated by the agri-food industry, with the aim of ensuring global food security at a time when the effects of climate change are more evident and the world's population is constantly growing. Biostimulants have the potential to mitigate these problems and provide a renewable option to improve crop quality and yield. In past years many biostimulating substances have been identified in biomass obtained from macroalgae but the difficulties in obtaining a renewable source of biomass, process standardization and reliability of macroalgae extract are economically unsustainable. A solution could be represented by microalgae which can offer a sustainable platform as a renewable source of biostimulants and allow the quality of the extract to be more easily governed under controlled conditions. Several studies have shown that the application of microalgal extracts to plants exert positive effects on the development, growth and yield of crops. Further studies comparing the activity of macroalgal biostimulants with microalgal ones suggest a similar biostimulating activity. Despite this evidence, the commercial implementation of microalgal biostimulants is hampered by the lack of research and high production costs. The aim of this research work is to identify in microalgae, bioactive compounds with biostimulating activity for crops subjected to abiotic stresses. Furthermore, the research objective will also focus on the identification and extraction of bioactive molecules from selected microalgae of interest to the pharmaceutical, nutraceutical and cosmetic industries, with the aim of establishing a production paradigm: the microalgae biorefinery.

Poster#32

Selection and characterization of Plant Growth Promoting Bacteria for a sustainable valorization of unexploited resources

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Rhizo- and endo-sphere of halophytic plants are an important source of Plant Growth Promoting Bacteria (PGPB), microorganisms able to contribute to the host's adaptation to adverse environmental conditions, improve tolerance against various biotic and abiotic stresses, reduce pathogen infection, without conferring pathogenicity. In the era of ecosystem degradation and climate change, PGPB stand up as a useful mean to develop a more sustainable agriculture and enhance plant growth and stress tolerance, also in marginal areas. The main goal of this first year of doctoral program was the isolation, characterization, and selection of potential PGPB from *Cakile marittima* plants collected in Apulian marginal areas (Margherita salt marshes). In particular, the microbiological sampling of leaf and roots was performed at two phenological stages to select and count mesophilic bacteria, *Pseudomonas* spp., *Bacillus* spp., *Actinobacteria*, and nitrogen fixing bacteria. Colonies with different morphology were randomly isolated, then purified and characterized in relation to some preliminary phenotypic tests (microscopic observation, Gram staining, spore production, catalase, oxidase,) and some specific tests (urease, ammonium production, nitrification, phosphate solubilization and salt tolerance). Mesophilic and nitrogen fixing bacteria showed the highest cell number (ca. 7 log CFU/g), whereas *Actinobacteria*, spore-forming bacteria and pseudomonads were at lower levels (ca. 6 log CFU/g). Approximately 150 isolates were obtained, mainly Gram-negative (58%) and catalase-positive (70%). Concerning other traits assessed, a great variability was recorded since the isolates showed different abilities, at various levels (weak, moderate, or high), in terms of ammonification/nitrification, phosphate solubilization, and salt tolerance.

Poster#33

Biocontrol of Citrus Mal secco: advances on effectiveness of BCAs based-formulations against *Plenodomus tracheiphilus* and deeply understanding of their population dynamics

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Mal secco, caused by *Plenodomus tracheiphilus*, is an economically important fungal vascular disease in citrus-growing countries of the Mediterranean basin. Limited control measures and further restriction on the use of copper led to investigate on alternative sustainable management solutions. The effectiveness of commercial products based on different biological control agents (BCAs) was evaluated through *in vitro* and *in vivo* experiments against *Plenodomus tracheiphilus* compared to chemical compounds. Commercial formulations based on *Bacillus amyloliquefaciens* and *Trichoderma* spp. provided the best performances in reducing disease incidence and symptoms severity on *Citrus volkameriana* seedlings maintained in growth chamber, suggesting their potential

application within an integrated management strategy. In the further research, different *Trichoderma* species will be tested under growth chamber conditions and the antagonist showing the best performance will be selected for in field experiments. Moreover, understanding the survival and plant colonization ability of antagonist microorganism will be a crucial step to assess their effectiveness and schedule application in the field. In detail, *Trichoderma* spp. and *Bacillus* sp. from internal wood and leaf tissue of treated citrus plants will be detected and quantified using both agar dilution method, which is based on the assessment of colony forming units (CFU), and qPCR assay for the estimation of DNA by using primers/probe set for *Trichoderma* and *Bacillus* strains. The results obtained from the current research pave the way for future experiments aimed at assessing effectiveness of BCAs in field conditions.

Poster#34

Precision Grapes Harvesting: A Robotic Solution for Grapes Fruit Detection and Picking using Machine Learning

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Agriculture has gone through transformational changes because of the rapid growth of artificial intelligence (AI) technologies. To overcome the difficulties associated with using conventional fruit harvesting techniques, automated robotic fruit harvesting has become a ground-breaking alternative. An automated fruit harvesting system integrates computer vision, robotics, and machine learning algorithms to identify ripe fruits accurately and efficiently. The robotic systems can precisely assess the size, position, and ripeness of the fruit using advanced cameras, allowing for selective picking of fruit with a minimum of crop damage. This study is planned to design a robotic grape harvesting system equipped with advanced computer vision capabilities for the real-time detection and classification of ripe grapes on the vineyard. In the research, firstly the different images of grapes from the field will be taken with the help of cameras and then image processing will be done by using image analysis software. The machine learning program for robotic grapes harvesting will be designed which can distinguish ripe grapes from unripe grapes, stem and leaves efficiently. The field testing of the system will be done by harvesting grapes in the vineyard. The performance efficiency of robotic system will be tested, and mechanical losses will be calculated. The data taken will be statistically analyzed.

Poster#35

Development and application of robotic technologies in the food sector

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During the last years, several events such as the pandemic, climate changes and the Russia-Ukrainian war have caused economic, societal, and environmental changes. Due to these events, we are witnessing an exceptional evolution of all those sectors that fall within the global economic sector. An extraordinary innovative approach that is fuelling the interest of academia and industries is the application of precision manufacturing, in other words, the creation of an object with unique properties and functionalities by tailoring the process to both the raw materials and the desired characteristics of the end-products. These objects would be impracticable by the traditional manufacturing processes. The robotic technology is one of the most important candidates to make reliable the ambitions of precision manufacturing especially in the food sector because it is very flexible, precise and an extremely adaptable to the high variance of food properties. Many benefits could be reached by robots since they ensure more efficient processes, improved health, safety, security, reduced waste and environmental effects as well as mitigating labour-intensive tasks. While these opportunities robots are exploited into many production systems, in the food industry it is adopted in only for few applications such as food handling and food packaging. The aim of this project is to extend the application of robotics in the food sector, through activities that will focus on food cutting and the kneading/mixing of dough. The intention of these activities is to exploit the possible benefits of robotics in this context and to investigate their effects on final products.

Poster#36

Sustainable viticulture: different strategies to enhance the resistance to the main fungal diseases on Sicilian cultivars

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The aim of this research project, funded by 'Istituto Regionale del Vino e dell'Olio della Regione Siciliana' is to obtain new grape varieties resistant to *Erysiphe necator* and *Plasmopara viticola*. The varieties included are five of the sicilian traditional ones. The strategies that will be used are traditional breeding and New Plant Breeding Technologies (NPBTs). Traditional breeding approach consists of the cross pollination of the selected varieties with pollen from resistant hybrids, provided by CREA-VE project partner. This activity has been performed twice in 2022 and 2023; the hybrids obtained from the pollination made in 2022 are growing and the molecular analysis is ongoing. This analysis consists of the application of marker assisted selection through capillary electrophoresis to individuate the SSR linked to the resistant traits. Among the different strategies of the NPBTs, it will be used the CRISPR/Cas9 system to edit protoplasts for the knock-out of some genes related to the susceptibility to downy and powdery mildew. For this purpose, we are setting a regeneration protocol of the selected varieties. Anthers and ovaries have been cultured *in vitro* to obtain embryogenic calli. So far, the cultivar 'Nero D'avola' produced embryogenic calli. In addition, the genome of the 5 sicilian varieties has been sequenced (Illumina pair-ends sequencing at a coverage of 50X) to discover genetic similarity and dissimilarity with the other grape genome available and to increase the knowledge of

the genetic background of the sicilian germplasm. The application of these strategies is promising for the obtainment of new genotypes with good agronomic traits and with increased resistance to powdery and downy mildew.

Poster#37

Study of natural (plants extracts) and biological (fungi/bacteria) means for the control of fungal pathogens and weeds

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Fungal pathogens and weeds are responsible for considerable quail-quantitative losses in many agro-alimentary crops. Moreover, they are also implied in the environmental impact as they are controlled by chemical treatment. Their chemical control in field is harmful to the environment and human health, especially during some cultural phases. The economic, environmental and ethical issues linked to the traditional management, as well as the agronomical problems, enforce the need to find sustainable alternatives to their management. Among the substances analysed by modern agriculture, from an environmental and circular bio-economic point of view, agricultural wastes (AW) are the most evaluated. In addition to natural compounds, the crops eco-friendly management is based also on the application of biocontrol agents (BCAs). The project aim is to identify possible AW and BCAs to be used in the eco- sustainable management of diseases fungi and weeds. In particular, the project will be articulated in the evaluation in vitro of the dried AW capability, in the unaltered state, in infusion or extracted in ethanol/methanol, to reduce the pathogens growth and the germination of the weeds seed, as well as the evaluation of the phytotoxic effect on the crops. Once the first evaluation in the laboratory has been carried out, the next phase would be performed in greenhouses and open fields. Meanwhile, the capability to control fungal diseases and weeds of some BCAs will be evaluated. Experiments will be performed to find and quantify the effects of these microorganisms. This project aims to identify AW and BCAs, capable to control both fungal pathogens and weeds, to use in combination with each other in order to amplify their individual control capabilities.