E-NICHE

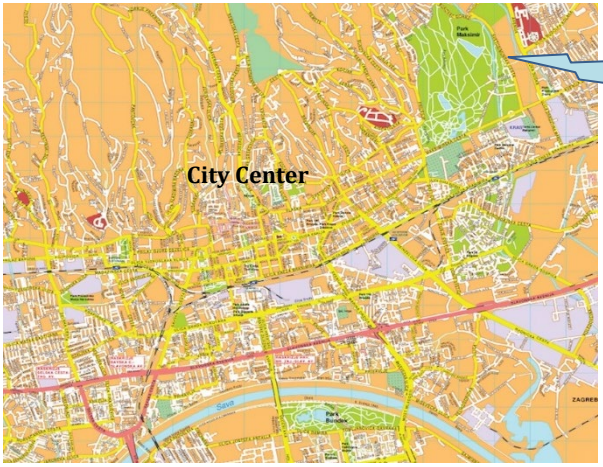
ZAGREB

7 – 9 September 2026

The Venue – University of Zagreb, Faculty of Agriculture, Department of Chemistry

Svetošimunska cesta 25, 10000 Zagreb

🏢 Pavillon 3, 1st floor – hall 3A



The faculty is located in the eastern part of Zagreb, near **Maksimir Park** easily accessible by tram (Ravnice station) and bus.

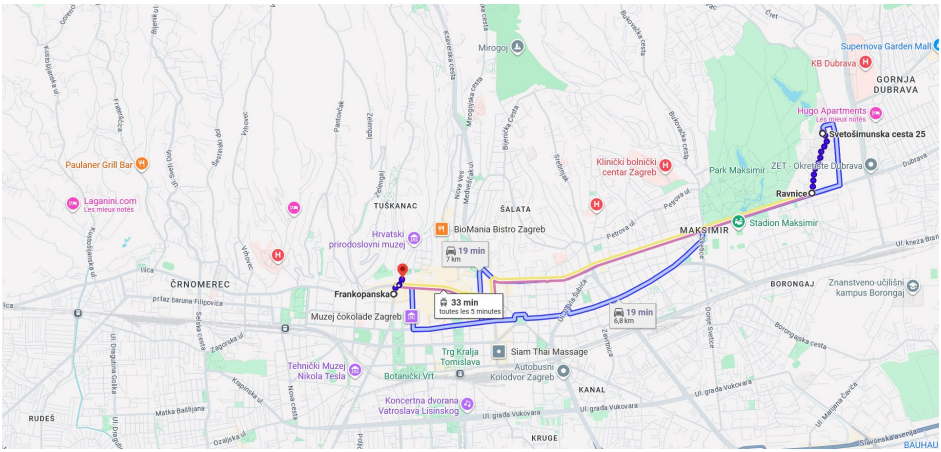
More info on Zagreb, directions, hotel, etc:
https://e-niche.eu/news/annual-e-niche-meeting-zagreb-croatia/

Info on the restaurant Stari Fijaker

Social dinner (for registrants) is
Tuesday, 8 September 2026
19h30-20h00 (at the latest)
Price: 35 euros (without drinks)

https://starifijaker.hr/
(https://www.tripadvisor.fr/Restaurant_Review-g294454-d810593-Reviews-Stari_Fijaker_900-Zagreb_Central_Croatia.html)

Address and direction
(33 minutes by tram and walk, see map below)
6 Mesnička Street, Zagreb.



Local organizers

Marko Vinceković (University of Zagreb, Faculty of Agriculture)
Luna Maslov Bandić (University of Zagreb, Faculty of Agriculture)
Marin Roje (Rudjer Boskovic Institute)

Meeting's Assistants:
XX (Local)
YY (Local)

Non local
Fanny Rulhand (Video)

Core Group:

Conxita	**Avila**
Anne-Geneviève	**Bagnères-Urbany**
Eduardo N.	**Barata**
Sylvie	**Baudino**
Laura	**Bellec**
Aurelie	**Cartereau**
Levent	**Cavas**
Stefano	**Colazza**
David	**Giron**
Júlia Katalin	**Jósvai (absent)**
Julie	**Maguire**
Maria	**Pappas**
Soizic	**Prado**
Christelle	**Robert**
Giovanna	**Romano (absent)**
François	**Verheggen (absent)**

DETAILED PROGRAM

	Monday 07 September			**Tuesday 08 September**			**Wednesday 09 September**
8h45	Arrivals MC &CG members		8h45	Arrivals Participants		8h45	Arrivals Participants
9h00	Management Committee Part 1		9h00	YRI special session 4 Talks (10+5min each) and 6 Poster presentations (5min each)		9h00	SME-Applied-Regulations special session 5 Talks (10+5min each)
10h30	Coffee Break		10h30	Coffee Break		10h15	Coffee Break
11h00	Management Committee Part 1		10h30	YRI special session 4 Talks (10+5min each) and 6 Poster presentations (5min each)		10h45	SME-Applied-Regulations special session 5 Talks (10+5min each)
						12h00	WGs' time
12h30	Lunch break MC members		12h30	Lunch break		12h30	Lunch break
13h30	Arrivals Participants		14h00	Poster session & Coffee time		14h00	5 talks (10+5min each)
14h00	Opening - Core Group presentations					15h15	Coffee break
15h30	5 talks (10+5min each)					15h45	5 talks (10+5min each)
16h45	Coffee break		16h30	4 Talks (10+5min each)		17h00	Discussions Closing of our journeys
17h15	5 talks (10+5min each)		17h30	Future EU projects after E-NICHE			
18h30	End of the day. Free evening		18h15	Building of the European association			
			18h45	End of the day (restaurant for registered at 20h00)			

YRI: Young Researchers and Innovator; SME: Small & Medium Entreprise; CG: Core Group

Monday 7 September

09h00 - 10h30	**Management Committee – Core Group Meeting: with presentation from the CG (WG leaders, representatives, GH manager) (41 people)**
10h30 - 11h00	**Coffee Break**
11h00 - 12h30	**Management Committee – Core Group Meeting (continued)**
12h30 - 13h30	**Lunch break (only MC & CG – 41p)**
13h30 - 14h00	**Welcome to participants – Badge distribution**
14h00 - 15h30	**Core Group presentation**

15h30 - 16h45 Talks (10min + 5min questions)

Plant–Insect Interactions

- Combining computer vision, genetics and metabolomics to identify specialized metabolites involved in pea aphid resistance in wild peas (**M. Galland**)
- Species-specific metabolic responses of Aesculus species to *Cameraria ohridella* infestation (**S. Sytnyk**)
- Plant nutritional ecology of turfgrass: effects of potassium availability on the development of *Spodoptera frugiperda* (**S. Attia**)
- **Individual** & interactive effects of drought-memory, herbivory, and development stage on oak phytochemistry (**M. Bakhtiari**)
- Cultivar-specific effects of the rhizosphere fungus *Trichoderma* on thrips resistance in *Chrysanthemum* (**M. Macel**)

16h45 – 17h15 Coffee break

17h15 – 18h30 Talks (10min + 5min questions)

Plant Metabolism, Adaptation and Chemical Diversity

- Plant invasion and global change reshape soil-microbiome interactions through soil legacy and exudate-driven responses (**K. Yanuka-Golub**)
- Selenium-mediated regulation of plant stress metabolism under uv-b radiation: physiological and transcriptomic insights (**A. Akpinar**)
- "GABA" a universal regulator (**M. Bor**)
- The ecological life cycle of plant specialized metabolites: following benzoxazinoids across biological scales (**Ch. Robert**)
- When the same is different (**P. Tóth**)

18h30 Free Evening

Tuesday 8 September

YOUNG RESEARCHERS & INNOVATORS (YRIs) SESSION

Organizer: Laura Bellec (YRI representative)

09h00 – 09h05 Introduction

09h05 – 10h 30 ***Session 1 – Plant Metabolism & Natural Products***

Oral Presentations (10min + 5min questions)

- Large-scale metabolomics of understudied plant lineages for natural product discovery (**K. Kučerová**)
- Mass Spectral Library Network (MERLIN): generation of public spectral libraries and community-driven expansion (**F. Brigante**)
- Functional characterization of monoterpene and sesquiterpene synthases from *Lavandula* species (**N. Yadav**)
- Sustainable synthesis and biological potential of natural product-inspired heterocycles (**H. Khachatryan**)

Flash Poster Presentations *(5min)*

- Does autotoxicity avoidance shape organ-specific chemodiversity? (**J. Bourenane-Vieira**)
- Identification and functional analysis of terpene synthases from *Lavandula* species (**N. Yadav**)
- Sustainable synthesis and biological potential of natural product-inspired heterocycles (**H. Khachatryan**)
- Effects of artificial night light colour on phytochemistry and its implications for plant–insect interactions (**C. Zamboni**)
- Enhanced anammox biofilm-mediated nitrogen and pharmaceuticals removal under anoxic conditions (**F. A. Mamun**)
- Volatile cues, rather than virulence alone, determine belowground entomopathogenic fungi efficacy against wireworms (**Fanny Ruhland**)

10h30 – 11h00 Coffee break

11h00 – 12h30 ***Session 2 – Ecological Interactions***

Oral Presentations (10min + 5min questions)

- Time heals all wounds: spatiotemporal patterns in plant–herbivore interactions (**M. Sanches**)
- Biofouling community changes observed in long-term antifouling coating field tests (**İ. Kirkiz**)

- Semiochemical regulation of *Tenebrio molitor* behaviour: effects of plant and fungal volatiles (**G. Bumbulytė-Žukevičienė**)
- Intercropping with aromatic plants in olive groves for masking host volatiles and managing olive fruit fly (*Bactrocera oleae*) (**M. H. Balci**)

Flash Poster Presentations *(5min)*

- Native strains of fungi as dual control agents against pests (**A. Moldovan**)
- Efficacy of myrrh essential oil as a grain protectant against major insect and mite pests (**N. G. Kavallieratos**)
- Plant–herbivore interactions are more dynamic than we measure (**M. Sanches**)
- Accumulation of selected metal(loid)s in three freshwater organisms occupying different trophic levels (**Z. Kiralj**)
- 12:20 – 12:25 Metal accumulation and biomarker responses in digestive glands of farmed and wild *Mytilus galloprovincialis* (**T. Mijošek Pavin**)
- 12:25 – 12:30 DoE-optimized fish oil nanostructured lipid carriers for enhanced oral carvedilol delivery in myocardial infarction (**M. Roncaglia dos Santos**)

12h30 - 13h30 Lunch break

13h30 – 16h30 Poster session & coffee time

16h30 - 17h30 Talks (10min + 5min questions)

Marine & Microbial Chemical Ecology

- Antarctic marine natural products under the heat (**C. Avila**)
- Exploring the roles of a vanadium bromoperoxidase in a brown alga using knock-out mutants and omics analyses (**C. Leblanc**)
- Diatom-bacteria communication under realistic microscale conditions – a chemical theoretical view (**Ch. Roggatz**)
- The importance of microbial chemical ecology (**P. Garbeva**)

17h30 – 18h15 Future EU projects after E-NICHE (M. Pappas)

18h15 - 18h45 From COST ACTION to lasting legacy: Building the European association for chemical ecology (**Ch Robert & E-NICHE Core Group**)

20h00 Restaurant in the city (voluntary joint dinner with previous registration (closed))

Wednesday 9th September

SME-APPLIED-REGULATION SESSION

Organizer Julia Maguire (SME representative)

9h00 -10h15 Session 1 - Talks (10min + 5min questions)

- Olfactory-based management of *Frankliniella occidentalis* using essential oils and volatile compounds (**E. Leppik**)
- Evaluating the trap efficiency of two pheromone compounds of male bean flower Thrips in the field in Kenya (**F. Drijfhout**)
- Evaluation of the efficacy of plant-based insecticides against stored-product pests: insights into biochemical modes of action (**M.C. Boukouvala**)
- Host plant preference of mosquitoes (**R. Ignell**)
- Repelling fruit flies with essential oils and their components: the peach fruit fly *Bactrocera zonata* (**A. Levi-Zada**)

10h15 - 10h45 Coffee Break

10h45 -12h00 Session 2 - Talks (10min + 5min questions)

- Synthesis and application of autoinducer-2 sugar derived prodrugs (**R. Ventura**)
- Encapsulation of the plant growth-promoting rhizobacterium *Pseudomonas brassicacearum* in biopolymer composite microparticles (**M. Vincekovic**)
- Mainstream anaerobic ammonium oxidizing n removal and switching of flows with sidestream, key microorganisms capable of resource recovery (**I. Zekker**)
- Advancing chemical risk assessment in Europe: integrating science, policy, and biodiversity protection (**C. Jousse**)
- A sea of rules: unlocking Europe's seaweed potential (**J. Maguire**)

12.00 - 12.30 WGs' time

12h30 – 14h00 Lunch Break

14h-15h15 General talks

Session 1 - Insect Chemical Ecology

- Senseapest: towards a portable analytical tool for efficient and non-invasive detection of plant pests (**A. Ficke**)
- Accelerating ligand discovery for insect odorant receptors by in silico approaches (**E. Jacquin-Joly**)
- Behavioral responses of *Halyomorpha halys* to phenology-specific volatile blends (**S. Andreadis**)

- Male-specific lactone enhances attraction of both sexes of *Bactrocera oleae* to ammonium bicarbonate (**C. Quero**)
- What dictates diversity in chemical defences of ithomiini butterflies? (**M. McClure**)

15h15 - 15h45 Coffee Break

15h45-17h00 General talks

Session 2 - Chemical Communication in Different Biological Systems

- Communicating in the dark: chemical signals in subterranean reptiles (**P. López**)
- Chemical language in mammalian signalling (**P. Stopka**)
- Chemical signalling in plant-microbe-nematode interactions (**L. Dong**)
- Interactions between bacterial symbionts of entomopathogenic nematode and tomato plants (**K. Karamanoli**)
- Effects of ozone pollution on plant-pollinator chemical communication under climate change: the case of the mediterranean fig tree and its specialized pollinator (**M. Proffit**)

17h00 Last discussion & Closing of our journeys

ORAL

COMMUNICATIONS

Abstracts of general and special sessions

(per topic and per day)

Monday 7 September

1/ Plant–Insect Interactions 15h30 – 16h45 (5 talks)
2/ Plant Metabolism, Adaptation and Chemical Diversity 17h15 – 18h30 (5 talks)

GOURDIN, O., RONDOT, J., FABIEN, T., LESNE, A., CHARTON S., GLORY, I., LE FLOCH, M., CHAPIN, E., M., PIQUEMAL, L., PARISEY, N., PILET-NAYEL, ML., ***GALLAND, M.***
IGEPP, IGEPP, INRAE, Institut Agro, Univ Rennes, 35653 Le Rheu, France

COMBINING COMPUTER VISION, GENETICS AND METABOLOMICS TO IDENTIFY SPECIALIZED METABOLITES INVOLVED IN PEA APHID RESISTANCE IN WILD PEAS.

Legumes and pea (*Pisum sativum* ssp. *sativum*) in particular, are key species towards a more sustainable agriculture. However, cultivation of pea is impaired by insect pests among which the pea aphid (*Acyrthosiphon pisum*) is the most problematic. Past results revealed that several genotypes of *Pisum fulvum* exhibited the strongest partial resistance to *A. pisum* among a collection of 240 pea genotypes. We hypothesize that this resistance is linked to specialized metabolites that remain to be discovered. To do this, three different interspecific populations of *P. sativum* x *P. fulvum* were created to produce Recombinant Inbred Lines (RILs) populations suitable for aphid performance assays, QTL analyses and metabolomics. High-resolution untargeted metabolomics of the parental lines revealed a strong induction of chemical defenses upon five days of adult aphid infestation in leaves of *P. fulvum* but not in *P. sativum*. Several metabolites differentially accumulated have been annotated. Future work will focus on RILs production and characterization at the genetic and metabolic levels to identify specific specialized metabolites involved in aphid resistance.

SYTNYK, S., *HOLOBORODKO K.*
Laboratory of Forestry and Forest Management, Dnipro, Ukraine

SPECIES-SPECIFIC METABOLIC RESPONSES OF *AESCULUS* SPECIES TO *CAMERARIA OHRIDELLA* INFESTATION

Cameraria ohridella is one of the most destructive invasive herbivores affecting ornamental *Aesculus* species throughout Europe. We investigated metabolic responses of six *Aesculus* species growing in the urban green infrastructure of Dnipro, Ukraine, to infestation by *C. ohridella*. Leaf extracts from healthy and infested plants were analyzed using GC–MS profiling. Comparative metabolic profiling revealed distinct species-specific responses to herbivory, indicating different biochemical strategies of plant defense among species. Infestation induced substantial metabolic reorganization, particularly in carbohydrate and polyphenol metabolism. Among the studied species, *Aesculus glabra* exhibited the most pronounced response, characterized by a marked reduction in metabolite diversity, accumulation of catechin, the emergence of quercetin, and the disappearance of chlorogenic acid. The observed species-specific responses improve our understanding of biochemical mechanisms underlying induced plant defense responses against invasive herbivorous insects and may contribute to the identification of metabolic markers associated with resistance in *Aesculus* trees.

ATTIA, S. *(1,2) & JOSEPH, S. V.* *(1)*

(1) Department of Entomology, University of Georgia, Griffin, Georgia, USA

(2) Laboratory of Bioaggressors and Integrated Pest Management in Agriculture (LR14AGR02), National Agronomic Institute of Tunisia (INAT), University of Carthage, Tunis, Tunisia

PLANT NUTRITIONAL ECOLOGY OF TURFGRASS: EFFECTS OF POTASSIUM AVAILABILITY ON THE DEVELOPMENT OF *SPODOPTERA FRUGIPERDA*

Turfgrass ecosystems play important ecological and economic roles in the USA, covering extensive areas across golf courses, athletic fields, and residential landscapes. However, these intensively managed systems are vulnerable to insect herbivory, particularly from the fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae), one of the most destructive lepidopteran pests worldwide. This pest causes severe defoliation of warm-season turfgrasses, resulting in significant economic losses. Its management is increasingly challenging due to high reproductive potential, migratory behavior, and insecticide resistance, highlighting the need for sustainable alternatives. Plant nutrition, particularly potassium (K), may enhance host plant resistance and influence herbivore performance. While nitrogen effects on plant–insect interactions are well documented, the role of K remains poorly understood. Potassium influences plant physiology, secondary metabolism, and herbivore-induced plant volatiles. This study aimed to evaluate the effect of K availability on *S. frugiperda* development, survival, and feeding performance on turfgrass.

BAKHTIARI, M., *EISENRING, M., GOSSNER, M.*

Laboratory of Forest Entomology, ETH domain Swiss Federal Research Institute, WSL Zurich, Switzerland

INDIVIDUAL & INTERACTIVE EFFECTS OF DROUGHT-MEMORY, HERBIVORY, AND DEVELOPMENT STAGE ON OAK PHYTOCHEMISTRY

This study examined how drought stress, herbivory, and oak developmental stage affect leaf chemistry and herbivory while controlling for among-tree genetic variation. In 2024, we grew 108 pedunculate oak (*Quercus robur*) clone DF159 saplings under moderate drought priming or control conditions, overwintered them unstressed, and transferred them to a glasshouse in spring 2025. In a full-factorial design, saplings experienced moderate drought, herbivory by Lymantria dispar, both treatments, or control conditions, and were sampled at two developmental stages. We measured herbivore performance and performed targeted and untargeted metabolomic analyses. Drought legacy was the dominant driver of oak phytochemistry, outweighing developmental stage effects for most defense metabolites. Effects of current drought and herbivory were mediated by drought memory, producing context-dependent changes in phenolics, tannins, phytohormones, and carbon metabolism. Oak defense is therefore a dynamic phenotype shaped by prior drought, current herbivore pressure, and developmental stage.

MACEL, M., *DEKKINGA, J.*
Aeres University of Applied Science, Almere, Netherlands
University of Amsterdam, Netherlands

CULTIVAR-SPECIFIC EFFECTS OF THE RHIZOSPHERE FUNGUS *TRICHODERMA* ON THRIPS RESISTANCE IN CHRYSANTHEMUM

Pesticides are still used in crop production but there is a need for sustainable alternatives. *Trichoderma harzianum* is a fungus which could help to reduce dependence on pesticides due to the beneficial effects which the fungus can have on plant growth and defence. This study investigated the effects of *T. harzianum* on the pest insect thrips (*F. occidentalis*), and chlorogenic acid levels and growth in four *Chrysanthemum* cultivars. Adding *T. harzianum* reduced thrips feeding and thrips development, and plant growth in two of the cultivars. Chlorogenic acid concentrations were lower in three *T. harzianum* treated cultivars, contrary to the hypothesis that this fungus would induce this plant defence compound. It is likely that chlorogenic acid does not play a role in *Chrysanthemum's* defence against thrips. Future research could investigate which metabolites are induced by *T. harzianum* and therefore may play a role in *Chrysanthemum's* defence against thrips. This information could be used by plant breeders to breed for *Chrysanthemum* cultivars which interact positively with the root fungus and naturally produce more of these defensive metabolites.

YANUKA-GOLUB, K.[1]*, SAWSAN HLESSN S.*[1]*, ABU-ALHOFN R.*[1]*, SADEQ, A.*[1]*, ABU-NASSARN J.*[2]*, MATZRAFI, M.*[2]

[1]The Institute of Applied Research, The Galilee Society, Israel. [2]Department of Plant Pathology and Weed Research, Newe-Ya'ar Research Center, Agricultural Research Organization – Volcani Institute, Ramat Yishay, Israel.

PLANT INVASION AND GLOBAL CHANGE RESHAPE SOIL-MICROBIOME INTERACTIONS THROUGH SOIL LEGACY AND EXUDATE-DRIVEN RESPONSES

Using the invasive *Conyza bonariensis* and native *Helminthotheca echioides*, we examined how plant–soil–microbiome interactions develop during growth, persist as soil legacies, and respond to root exudates. Plants were grown alone or in competition under warming, elevated CO_2, or nitrogen enrichment. Elevated CO_2 most strongly enhanced invasive plant performance, whereas warming effects were more pronounced under competition. After plant removal, native- and invasive-conditioned soils remained distinct, primarily through reorganization of a shared microbiome and contrasting microbial network structure. Exudate-swap incubations showed that only invasive exudates reduced extracellular enzyme activity in native-conditioned soil, increasing functional differentiation between soil legacies. Overall, invasion and global change altered microbial organization and carbon- and nitrogen-cycling functions during and after plant growth.

***AKPINAR, A.**, İPEK, M., CANSEV, A., USLU, O.Y., ÇAVUŞOĞLU, O.*
Bursa Uludag University, Vocational School of Technical Sciences, Department of Park and Horticulture, (Bursa, Turkey), aysegulakpinar@uludag.edu.tr

SELENIUM-MEDIATED REGULATION OF PLANT STRESS METABOLISM UNDER UV-B RADIATION: PHYSIOLOGICAL AND TRANSCRIPTOMIC INSIGHTS

Increasing UV-B radiation associated with climate change represents a major abiotic stress factor affecting plant productivity and physiology. Selenium (Se) is recognized as a beneficial element that enhances plant stress tolerance; however, the molecular mechanisms underlying its dose-dependent effects under UV-B stress remain poorly understood. We investigated the physiological and transcriptomic responses of *Spinacia oleracea* L. exposed to UV-B radiation and treated with different Se concentrations (0.5, 1, 2, and 3 mg/L). Se improved UV-B tolerance in a dose-dependent manner, with 1 mg/L providing the strongest protective effect by preserving photosynthetic pigments and enhancing antioxidant capacity. RNA-seq analyses of the most effective Se concentrations (1 and 2 mg/L) revealed that Se modulates genes involved in redox homeostasis, hormone signaling, stress-associated metabolism, including flavonoid and glutathione pathways. These findings provide new insights into how Se shapes plant chemical and molecular responses to UV-B stress and contributes to our understanding of stress-associated metabolism in plants.

BOR Melike
Ege University Faculty of Science Department of Biology
Izmir, TURKIYE

“GABA” A UNIVERSAL REGULATOR

Gamma-aminobutyric acid (GABA) is a ubiquitous non-protein amino acid. It was first discovered in potato tubers in 1949 and later identified as a major inhibitory neurotransmitter in mammals (**1**,**2**). In plants, GABA functions in protection against abiotic and biotic stresses, regulation of pollen tube growth, metabolism, growth and development, pH regulation, and signaling (**1**,**2**). It is possible to manipulate GABA levels through metabolic engineering or exogenous treatments for enhancing plant stress tolerance and nutritional quality. Despite decades of research, many aspects of GABA function remain unresolved and its diverse roles continue to raise important questions across different biological systems and organism. Here we aim to present GABA in plants through its relevance to agriculture and health by summarizing years of our lab’s work and recent findings in the field for future research perspectives.

1) Palabıyık, Ş.; Çetinkaya, İ.; Öztürk, T.; Bor, M. 2025, In *GABA in Plants*. Wiley.
2) Fromm H. *J. Exp. Bot*. 2020, 71(20), 6238-6245

ROBERT, Christelle
Chemical Ecology and Health, University of Bern, Bern, Switzerland

THE ECOLOGICAL LIFE CYCLE OF PLANT SPECIALIZED METABOLITES: FOLLOWING BENZOXAZINOIDS ACROSS BIOLOGICAL SCALES

Plants produce an extraordinary diversity of specialized metabolites that shape interactions with their environment. Yet, our understanding of how specialized metabolites are transformed, recycled and continue to influence ecosystem processes across biological scales remains fragmented. Using benzoxazinoids, a family of specialized metabolites produced by grasses, I propose the concept of "*ecological life cycle of plant specialized metabolites*". This framework follows benzoxazinoids from biosynthesis and function within plants, through their release into soils, microbial transformation, uptake and reuse by other organisms, transfer through agricultural production and food systems, metabolism and excretion by livestock, and their eventual return to agricultural soils. This model illustrates how the ecological identity of a specialized metabolite evolves throughout its life cycle, and may inspire a broader view of plant chemistry as a driver of ecosystem processes across space, time, and trophic levels.

TÓTH, P[1], HUIZINGA, S.[2], BOUWMEESTER, H[2].
[1]bioTomal, Rúbaň 176, Slovakia, [2]Swammerdam Institute for Life Sciences, University of Amsterdam, Amsterdam, The Netherlands

WHEN THE SAME IS DIFFERENT.

Plants can communicate with their surroundings using volatile organic compounds (VOCs). *Phelipanche ramosa (*Orobanchaceae) is a prime example of evolutionary development. We analysed the VOCs of parasitic plants growing in Slovakia (white flowers) and Italy (dark blue flowers). We hypothesise that these are different chemotypes of the same plant species, arising due to the influence of the host plant on the genetic makeup. Therefore, we can say that the evolutionary shift of specific individuals of a plant species and their characteristics in response to environmental adaptation causes the phenomenon of 'when the same is different'.

Tuesday 8 September

1/ YRI Special Session (Morning) (8 talks)

2/ Marine & Microbial Chemical Ecology 16h30 – 17h30 (4 talks)

3/ European Association of Chemical (1 talk)

1/ YRI Oral Session

KUČEROVÁ, K., *DAMIANI, T., NIKOLSKAIA, I., ALLARD, P.-M., DEFOSSEZ, E., RYBKA, V., HOWES, M.-J., PLUSKAL, T*
Institute of Organic Chemistry of the Czech Academy of Sciences, Prague, Czech republic

LARGE-SCALE METABOLOMICS OF UNDERSTUDIED PLANT LINEAGES FOR NATURAL PRODUCT DISCOVERY

The Plant Kingdom represents a vast source of chemical diversity, yet most plant species remain chemically unexplored. This project aims to discover novel plant natural products from understudied plant lineages using large-scale LC–MS-based metabolomics and computational data analysis. To prioritize chemically unexplored taxa, we combined automated mining of scientific literature and natural product databases, identifying more than 6,450 plant genera with limited phytochemical investigation. Plant material was collected using standardized protocols within the Digital Botanical Garden Initiative. So far, 1,876 plant extracts from nearly 1,000 species have been analyzed by LC–MS/MS. Data were processed using MZmine and DreaMS, a machine learning model that embeds MS/MS spectra into a chemical representation space, enabling prioritization of chemically distinct metabolites (Bushuiev *et al*., *Nature Biotechnology*, 2025). Candidate metabolites were selected based on DreaMS-derived novelty scores. Current work focuses on the structural elucidation of prioritized metabolites, aiming to expand the known chemical space of the plant kingdom.

BRIGANTE, F., *BRUNGS, C., BUSHUIEV, R., JOSEFOV, F., PLUSKAL, T.*
Institute of Organic Chemistry and Biochemistry of the Czech Academy of Sciences, Prague, Czech Republic.
Biochemistry of Specialized Metabolites - Pluskal Lab, Prague, Czech Republic

MASS SPECTRAL LIBRARY NETWORK (MERLIN): GENERATION OF PUBLIC SPECTRAL LIBRARIES AND COMMUNITY-DRIVEN EXPANSION.

With ~10^60 possible small molecules, matching spectra to structures remains highly challenging [1], particularly for natural products, ocurring at low abundance with complex scaffolds and stereochemistry. Confident molecular annotation therefore depends on high-quality reference mass spectral libraries; however, current open libraries often lack chemical coverage, provide only MS^2 data, or are expensive, [2]. So, we are developing an open-source, multi-stage MS^n spectral library. The MSnLib project [3] established the full Python-based workflow, including data cleanup, sample preparation, flow-injection Orbitrap acquisition, and MS^n processing for experiments from $2 < n \leq 5$. 30,000 compounds are available for download and integrate into metabolomics workflows. Based on this, a community-driven expansion includes 260,000 compounds by 2027. This will provide an open-source, license-free, high-coverage MS^n library for immediate use.

[1] Franco, L. S., et al., (2024), doi: 10.3390/ph17060742.
[2] Li, G., Peng, X., et al., (2021), doi: 10.3389/fchem.2021.761609
[3] Brungs, C., et al. (2025), doi: 10.1038/s41592-025-02813-0

YADAV, N., *SIMONSEN, H.T., MOJA, S.*
Laboratoire de Biotechnologies Végétales Appliquées aux Plantes Aromatiques et Médicinales (LBVpam), Université Jean Monnet, Saint-Étienne, France

FUNCTIONAL CHARACTERIZATION OF MONOTERPENE AND SESQUITERPENE SYNTHASES FROM *LAVANDULA SPECIES*

Terpene synthases (TPSs) generate the remarkable diversity of mono- and sesquiterpenes found in lavender essential oils. In this study, five candidate TPS genes from *Lavandula angustifolia* and *Lavandula × intermedia* were identified, cloned and functionally characterized. Recombinant proteins were expressed in *Escherichia coli* and *in vitro* activity assay was carried out along with the transient expression in *Nicotiana benthamiana*. Volatile products were analysed using GC–MS, confirming the catalytic activity of the selected TPSs and revealing distinct terpene product profiles. These findings expand our understanding of terpene biosynthesis in lavender and provide valuable candidates for future biochemical, structural and metabolic engineering studies.

KHACHATRYAN, H.
Scientific and Technological Center of Organic and Pharmaceutical Chemistry National Academy of Sciences. Republic of Armenia, Yerevan

SUSTAINABLE SYNTHESIS AND BIOLOGICAL POTENTIAL OF NATURAL PRODUCT-INSPIRED HETEROCYCLES

Natural products continue to inspire sustainable synthesis and the development of biologically relevant heterocycles with medicinal potential [1–3]. These studies demonstrate that green synthetic strategies combined with natural product-inspired design offer sustainable routes to biologically relevant heterocycles with medicinal potential.

1. Millar, S.B.; Khachatryan, H.N.; Malmir, M.; Sperry, J. *Sustainable Chemistry and Pharmacy* 2024, *42*, 101798.
2. Malmir, M.; Mata, E.G.; Delpiccolo, C.M.L.; Singh, S.; Khachatryan, H.N.; Wang, C.; Sperry, J. *Tetrahedron* 2025, *186*, 134866.
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TIME HEALS ALL WOUNDS: SPATIOTEMPORAL PATTERNS IN PLANT-HERBIVORE INTERACTIONS

Plant–herbivore interactions are among the most widespread ecological relationships on Earth, shaped by more than 300 million years of coevolution. To counter herbivore attack, plants have evolved inducible chemical defences that vary across space and time. Despite extensive study of these defences, their spatiotemporal dynamics, and how such dynamics drive their ecological function, remain poorly understood. This project aims to investigate the dynamic interplay between herbivory and plant responses to understand how chemical defences unfold over time and shape plant–herbivore interactions across ecological contexts. As a first step, we conducted a meta-analysis of 356 studies that measured herbivore-induced chemical defences at three or more time points to identify, for the first time, general temporal patterns in induced defense. With that, we will experimentally examine the dynamic plant-herbivore interactions using *Plantago lanceolata* and *Vanessa cardui* as a model system. The project seeks to uncover how the timing of plant responses interacts with herbivore behaviour, providing new insights into the ecological significance of inducible chemical defences.

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BIOFOULING COMMUNITY CHANGES OBSERVED IN LONG-TERM ANTIFOULING COATING FIELD TESTS

Marine biofouling on the surfaces of ships and marine structures is a major challenge. Evaluating the performance of antifouling coatings is therefore essential for the development of sustainable maritime applications. This study reports the two new species found on the field test apparatus used to assess the effectiveness of antifouling coatings. Our research group has been conducting long-term field tests in the Aegean Sea. Throughout these studies, barnacles, tube worms and algae species have consistently been the dominant biofouling organisms. However, during our most recent field trials, two additional species were recorded for the first time: *Dactylopusia paratisboides* (Copepoda) and *Branchiomma lucullanum* (Polychaete). Copepods and Polychaetes are vulnerable species when they are exposed to antifouling booster biocides. Since the settlement and succession of fouling organisms are strongly regulated by chemical cues released from microbial biofilms, and neighboring organisms, better understanding of natural chemical signaling mechanisms can guide the development of antifouling coatings.

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SEMIOCHEMICAL REGULATION OF *TENEBRIO MOLITOR* BEHAVIOUR: EFFECTS OF PLANT AND FUNGAL VOLATILES

Behavioural responses of *Tenebrio molitor* to natural volatile organic compounds (VOCs) are relevant for both pest management and commercial insect rearing. This research area investigates how VOCs of different biological origins affect the behaviour of *T. molitor*. Plant essential oils showed varying repellency against *T. molitor*, with spearmint (*Mentha spicata*) and clove (*Eugenia caryophyllus*) exhibiting the strongest effects. Among the major EO constituents tested, carvone and terpinen-4-ol were the most effective repellents. VOCs released by *Aspergillus flavus*-infected wheat grains also significantly affected *T. molitor* behaviour, with females showing greater sensitivity to fungal contamination than males and discriminating infected grains at earlier stages of infection. Individual fungal VOCs elicited both repellent and attractive responses: hexanal acted as a repellent for both sexes, 1-octen-3-ol repelled males, while 1-hexanol and 3-methylbutan-1-ol attracted females under specific concentrations. These findings demonstrate that *T. molitor* behaviour is regulated by a diverse range of naturally occurring volatile chemical cues originating from different biological sources.

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Directorate of Bornova Plant Protection Research Instıtute, Chemical Ecology Lab, İzmir, Türkiye

INTERCROPPING WITH AROMATIC PLANTS IN OLIVE GROVES FOR MASKING HOST VOLATILES AND MANAGING OLIVE FRUIT FLY (*BACTROCERA OLEAE*)

This study evaluated the potential of volatile-rich medicinal and aromatic plants to interfere with host-location behaviour of the olive fruit fly, *Bactrocera oleae*, by masking host odours. Essential oils were extracted by hydrodistillation from lavender, anise, peppermint, coriander, Turkish sage, common sage, yarrow, fennel, rosemary, Turkish oregano, and olive fruit oil using a Clevenger apparatus. The oils were analysed by electroantennography (EAG), and those eliciting the strongest responses—Turkish sage, rosemary, lavender, and coriander—were selected for four-arm olfactometer assays. A blend of 100 g olive fruit and 10 µL olive oil was found to be attractive to mated females. The selected oils were added to this blend and tested in 32 replicates. Rosemary and lavender treatments did not differ significantly from empty control arms, suggesting that these oils masked host volatiles and disrupted fly orientation. Coriander showed strong repellency, while Turkish sage exhibited moderate repellency. These findings suggest that intercropping olive groves with these plants may offer a sustainable strategy for reducing *B. oleae* host orientation, although open-field validation is needed.

Marine & Microbial Chemical Ecology

AVILA, Conxita

Departament de Biologia Evolutiva, Ecologia i Ciències Ambientals (BEECA), Facultat de Biologia, Universitat de Barcelona, Barcelona, Catalonia

ANTARCTIC MARINE NATURAL PRODUCTS UNDER THE HEAT

Global change is causing profound ecological impacts on Antarctic marine ecosystems, although many of these effects remain poorly understood. Antarctic benthic communities are dominated by diverse marine invertebrates, including tunicates and sponges, which rely on natural products as key chemical defenses against predators and other ecological interactions. Understanding how climate-driven environmental changes affect these chemical defenses is therefore essential to assess the resilience of Antarctic marine benthic organisms. Here, we investigated the effects of gradual seawater warming under controlled aquarium conditions on the chemical profiles of two Antarctic benthic invertebrates. Our findings demonstrate that moderate seawater warming induces substantial changes in the chemical defenses of Antarctic benthic invertebrates, while temperatures exceeding 4°C compromise organism integrity and survival. Further investigation of the ecological functions of these secondary metabolites and their molecular regulation will improve our understanding of the resilience and adaptive capacity of Antarctic benthic communities under ongoing global change.

PETI-JEAN, E.[1,2], TESTI, S.[1], DELAGE, L.[1], PUPPO, R.[2], MARIE, A.[2], GODFROY, O.[1], BADIS, Y.[1], DITTAMI, S.[1], PRADO, S.[2], ***LEBLANC C.[1]***

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[2] Molécules de Communication et Adaptation des Micro-organismes, MCAM, MNHN, CNRS, Paris, France

EXPLORING THE ROLES OF A VANADIUM BROMOPEROXIDASE IN A BROWN ALGA USING KNOCK-OUT MUTANTS AND OMICS ANALYSES

Marine biogenic halogenated metabolites are likely involved in signaling and defense during biotic and abiotic interactions. In brown algae, the halogen metabolism and its role are still poorly understood. To address this gap, we produced knock-out (KO) mutants for a vBPO gene, putatively involved in halogenation, in the brown alga *Ectocarpus*. Biological and molecular responses of KO and wild-type (WT) strains were compared using metabarcoding, transcriptomic and metabolomic analyses. Although their growth was not affected, the photosynthetic efficiency of the mutants was reduced at high light intensities, and their associated microbiome modified compared to WT. Chemical LCMS profiles also showed distinct patterns, particularly in polar and reserve lipids. In addition, 24-hours oxidative stress revealed specific transcriptomic and metabolomic responses in mutants. Overall, these results highlighted complex and intricate regulatory mechanisms of vBPO-based pathways, especially upon oxidative stress.

ROGGATZ, Christina C.
Dynamic Ecological Chemistry, Faculty of Biology & Chemistry/UFT/MARUM, University of Bremen, Germany

DIATOM-BACTERIA COMMUNICATION UNDER REALISTIC MICROSCALE CONDITIONS – A CHEMICAL THEORETICAL VIEW

Communication and interaction in marine diatom-bacteria communities is coordinated through a multitude of compounds and takes place in a highly dynamic environment. Respiration and photosynthesis can create steep spatial gradients and large fluctuations in pH and oxygen on diurnal timescales. The sensitivity of biomolecules involved in microbial interactions to such dynamic microscale environments remains unexplored. Using theoretical chemical tools, I assessed a dataset of marine diatom- and bacteria-associated compounds for their sensitivity to pH changes typical for pelagic phycosphere and benthic microbial mat conditions. The analysis uncovered a high level of pH-sensitivity linked to specific chemical functional groups. Sensitivity of compounds also differed for producers, primary receivers and roles of compounds. This first theoretical analysis provides the starting point to derive testable hypotheses and will guide future experimental assessments of the role of pH in diatom-bacteria interactions.

GARBEVA, Paolina
The Netherlands Institute of Ecology

THE IMPORTANCE OF MICROBIAL CHEMICAL ECOLOGY

Microbial chemical ecology investigates how microorganisms interact through the production and perception of a diverse array of chemical signals and metabolites. These interactions, mediated by both volatile and non-volatile compounds, play crucial roles in communication, competition, cooperation, and adaptation within microbial communities.
In this talk, I will present examples highlighting the ecological significance of microbial volatile and non-volatile metabolites and discuss how these compounds shape interactions between microorganisms and their environment. Understanding these chemical interactions not only provides fundamental insights into microbial ecology but also opens new opportunities for applications in agriculture and biotechnology.

ROBERT, C., *BAGNÈRES A.-G., and the E-NICHE CORE GROUP*
Chemical Ecology and Health, University of Bern, Bern, Switzerland

FROM COST ACTION TO LASTING LEGACY:
BUILDING THE EUROPEAN ASSOCIATION FOR CHEMICAL ECOLOGY

Chemical ecology provides fundamental insights into how naturally occurring chemicals mediate interactions among organisms while contributing to sustainable agriculture, biodiversity conservation, environmental protection, and One Health. Despite its importance, the European chemical ecology community remained fragmented across disciplines, countries, and sectors. Within 4 years, the COST Action E-NICHE (European Network in Chemical Ecology) has brought together 331 participants from 43 countries through networking, training, and knowledge-sharing activities, demonstrating both the need for and feasibility of a coordinated European community. Building on this success, we present the vision for the European Association for Chemical Ecology (E-NICHE Association). The Association will provide a platform to foster scientific excellence, collaborations, early-career development, and engagement with industry and policy, strengthening Europe's contribution to the global chemical ecology community. We invite the community to join this initiative and help ensure the long-term continuity, visibility, and impact of chemical ecology in Europe.

Wednesday 9 September

1/Morning - SME-Applied-Rules Session (10 talks)

2/ Afternoon - General talks
Session - Insect Chemical Ecology (5 talks)
Session - Chemical Communication in Different Biological Systems (5 talks)

SME-Applied-Rules Session

LEPPIK, E.[1]*, MOGHADDASI, Y.*[1]*, TARDOURI, T.*[1]*, ROUEN, M.*[1]*, TIXERONT, M.*[1]*, MAUGIN, E.*[2]*, COUSSY, B.*[3]

[1] Agriodor, Rennes, France; [2] Astredhor, Villenave-d'Ornon, France; [3]CTIFL, Balandran, France

OLFACTORY-BASED MANAGEMENT OF *FRANKLINIELLA OCCIDENTALIS* USING ESSENTIAL OILS AND VOLATILE COMPOUNDS

The western flower thrips (*Frankliniella occidentalis*) is a major agricultural pest causing direct feeding damage and transmitting plant viruses. Increasing restrictions on synthetic insecticides have stimulated the search for sustainable alternatives based on plant volatile organic compounds (VOCs) and essential oils. We evaluated the behavioural responses of F. occidentalis to selected VOCs and essential oils using dual-choice olfactometer assays at multiple concentrations. Repellency was quantified using a Repellency Index (RI). Strong differences were observed among compounds, with several candidates inducing significant avoidance behaviour. Considering both behavioural activity and physicochemical properties, including volatility and diffusion rate, one candidate showed high repellency at relatively low emission rates, indicating favourable field application potential. These results demonstrate that selected plant-derived volatiles can disrupt host-selection behaviour and represent promising tools for environmentally sustainable thrips management, particularly within push–pull strategies integrating semiochemicals with biological control.

DRIJFHOUT, F., *MFUTI, D., AKINYEMI, A., TAMIRU, A., SUBRAMANIAN, S., POPE, T., CAMPBELL, H., KIRK, W.*

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EVALUATING THE TRAP EFFICIENCY OF TWO PHEROMONE COMPOUNDS OF MALE BEAN FLOWER THRIPS IN THE FIELD IN KENYA

The bean flower thrips (BFT), *Megalurothrips sjostedti* (Thysanoptera: Thripidae), is a key pest of legumes in sub-Saharan Africa. Cowpea is important in subsistence farming and it is consumed daily by about 200 million people worldwide. Thrips are difficult to control because they are very small and retreat into small inaccessible spaces on plants. A heavy infestation can cause total crop loss. To control the damage by BFT, farmers often rely on the use of pesticides. Recently, two distinct pheromone compounds have been identified in the headspace of male BFT. Behavioral assays in the laboratory indicated enhanced attraction of both BFT males and females to these identified compounds. The exact role of the two compounds thus far remains unclear. Experiments using blue traps carried out in Kenya indicated that these compounds attract both males and females. There were significant differences in the attraction of female BFT between the different concentrations for both of the synthetic BFT pheromone compounds. The usefulness of these compounds in integrated pest management, and the role of nonvolatile hydrocarbons in mate and species recognition will be discussed.

KAVALLIERATOS, N. G., ***BOUKOUVALA, M. C.****, FILINTAS, C. S., GIDARI, D. L. S., SKOURTI, A., KYRPISLIDI, V. P. C., MAGGI, F., PETRELLI, R., SPINOZZI, E., FERRATI, M., TERUZZI, C., & ARANITI, F.*

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EVALUATION OF THE EFFICACY OF PLANT-BASED INSECTICIDES AGAINST STORED-PRODUCT PESTS: INSIGHTS INTO BIOCHEMICAL MODES OF ACTION

Botanical insecticides offer eco-friendly alternatives for stored-product pest control. This study evaluated the essential oil (EO) from *Commiphora myrrha* (Nees) Engl. oleo-gum-resin, rich in furanoeudesma-1,3-diene and curzerene, against *Prostephanus truncatus* (Horn) and *Sitophilus zeamais* Motschulsky, as well as the metabolic shifts caused in both species. At 1000 ppm, the EO caused high mortality in *P. truncatus* (~86%) but only moderate mortality in *S. zeamais* (~26%). Untargeted GC-MS metabolomic profiling, combined with multivariate, univariate, and network analyses, revealed species-specific metabolic disruptions following exposure to myrrh EO versus the synthetic insecticide pirimiphos-methyl (positive control). These findings highlight the potential of *C. myrrha* EO as a botanical insecticide, particularly against *P. truncatus*, and demonstrate the value of metabolomic approaches for elucidating the insecticidal mechanisms and identifying the biomarkers of exposure vital for integration in pest management strategies.

IGNELL, Rickard

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HOST PLANT PREFERENCE OF MOSQUITOES

Mosquitoes, like other insects, depend on plant-derived sugars for building energy reserves for flight and survival, as well as reproduction, generally reflected in a positive preference-performance. In my presentation, I will provide an insight to how mosquitoes are attracted to, and discriminate among, potential host plants, which may be of general interest for those studying insect-plant interactions. In addition, I will present recent data on the natural host plant preference of mosquitoes and how this is affected by the malaria parasite, *Plasmodium falciparum.*

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REPELLING FRUIT FLIES WITH ESSENTIAL OILS AND THEIR COMPONENTS: THE PEACH FRUIT FLY *BACTROCERA ZONATA*

The peach fruit fly (PFF) *Bactrocera zonata* (Diptera: Tephritidae) is a major agricultural pest attacking the fruits of at least 55 plants of economic importance. Previous studies have identified unique compounds in each sex, but none of these appear attractive to either sex. However, it is well known that methyl eugenol (ME) found in nectaries of many plants is strongly attractive to males, while food baits are weakly attractive to both sexes. The present study was designed to find repellent substances for the PFF to implement "push-pull" methods as part of efforts to control the pest and protect orchards. After systematically screening 82 commercial essential oils (EOs) of plants presented in various combinations in field experiments, we found that two EOs were the most repellent causing over 95% trap shutdown for PFF males and females at different timings and in different orchards (i.e., citrus and mango). We also tested the components of these two EOs and found that artemisia ketone, a component of Yarrow EO, causes a significant trap shutdown of 98% for males and 92% for females. Our findings could be developed for push-pull management of PFF and other fruit flies attracted to ME.

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SYNTHESIS AND APPLICATION OF AUTOINDUCER-2 SUGAR DERIVED PRODRUGS

Bacteria coordinate population behaviour by secreting and sensing small molecules called autoinducers, a process known as quorum sensing (QS). Autoinducer-2 (AI-2) stands out as a potential "universal" signalling molecule for inter-species communication.[1,2,3] AI-2 plays a key role in gut microflora homeostasis and can mitigate antibiotic-induced microbiota imbalances,[3] suggesting synthetic AI-2 may help restore healthy bacterial ratios after antibiotic treatment. We present synthetic strategies towards AI-2 prodrugs for oral delivery to the gut, based on colon-specific drug delivery systems. The prodrugs consist of AI-2 linked to beta-glycosides selectively hydrolysed by beta-glucosidases and beta-galactosidases from the gut microbiota. Enzymatic release was demonstrated with commercial beta-glycosidases, mice faecal extracts and *in vivo* studies, and AI-2 quantified using a new GC-MS method developed by our group.[4]

1. Rodrigues, M.V. et al. *Is. J. Chem.* 2023, *63*, e202200091.| **2.** Ascenso, O.S. et al. *Bioorg. Med. Chem.* 2011, *19*, 1236.| **3.** Pereira, C.S. et al. *FEMS Microbiology Reviews* 2013, *37*, 156.| **4.** Rodrigues, M.V. et al. *Bioorg. Chem.* 2025, 157, 108274.

VINCEKOVIĆ, M., *GAŠPARIĆ, K., VLAHOVIČEK-KAHLINA, K., HULAK, N.*
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ENCAPSULATION OF THE PLANT GROWTH-PROMOTING RHIZOBACTERIUM *PSEUDOMONAS BRASSICACEARUM* IN BIOPOLYMER COMPOSITE MICROPARTICLES

The encapsulation of *Pseudomonas brassicacearum* into composite biopolymer microparticles was achieved using the ionic gelation technique with natural polysaccharides as biodegradable carrier matrices. Physicochemical characterization was performed using Fourier-transform infrared spectroscopy (FTIR), optical microscopy (OM), scanning electron microscopy (SEM), atomic force microscopy (AFM), and UV–VIS spectroscopy to evaluate polymer interactions, particle morphology, surface topology, encapsulation efficiency, and release behavior. The encapsulation process produced spherical, structurally stable microparticles with homogeneous morphology and high bacterial retention. Controlled-release studies demonstrated sustained bacterial liberation while preserving cell viability. These findings indicate that ionic gelation-derived composite biopolymer microparticles represent a promising platform for PGPR delivery, improving microbial stability, enhancing plant–microbe interactions, and supporting sustainable crop production.

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MAINSTREAM ANAEROBIC AMMONIUM OXIDIZING N REMOVAL AND SWITCHING OF FLOWS WITH SIDESTREAM, KEY MICROORGANISMS CAPABLE OF RESOURCE RECOVERY

Implementing mainstream anaerobic ammonium oxidation (anammox) remains technically challenging due to the inhibitory effects of low operational temperatures and elevated organic carbon loads. This study investigates a strategic "flow-switching" operational mode to sustain anammox activity by periodically alternating a 20 L biofilm reactor between warm-temperature sidestream (>22 °C) and cold-temperature mainstream conditions (16.5 °C). Using a combination of biogas plant effluent and synthetic municipal wastewater, the system demonstrated robust resilience. The peak total nitrogen removal rate (TNRR) reached 527 g N m^{-3} d^{-1} during sidestream phases characterized by low COD/TN ratios (1.1:1). Transitioning to mainstream conditions (COD/TN 3.2:1) resulted in a stabilized average TNRR of 20 (±15) g N m^{-3} d^{-1}. Batch assays revealed that nitrogen removal performance is highly sensitive to organic thresholds; while optimal performance (≈ 5 mg N g^{-1} TSS h^{-1}) was maintained at COD levels of 480 mg L^{-1}, substantial suppression occurred at 2600 mg L^{-1} (TOC/TN 8:1).

JOUSSE, C., AXELMAN, J. & HORNEK-GAUSTERER, R.
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ADVANCING CHEMICAL RISK ASSESSMENT IN EUROPE: INTEGRATING SCIENCE, POLICY, AND BIODIVERSITY PROTECTION

The Partnership for the Assessment of Risks from Chemicals (PARC) aims to advance next-generation (NG) chemical risk assessment to better protect human health and the environment (j.cotox.2025.100517). It supports the European Commission's actions (*e.g.* "phasing out animal testing" and the "Green Deal") by generating new data, knowledge, methodologies, tools, then expertise and collaborative networks. PARC brings together more than 200 partners across Europe, including universities and competent authorities in environmental and public health from 28 countries, as well as three EU agencies (ECHA, EFSA & EEA). Coordinated networking & creation of new synergies are key to be successful on environmental / chemical risk assessment (E/C RA; j.envint.2025.109974).
Then, the PARC project MIND (Map-Integrate-Network-Drive) develops an agency-driven, co-created, long-term knowledge ecosystem for ERA. Goals are to connect people, practices and resources across science & regulation. The platform supports the implementation of NG ERA, facilitates science-policy exchange and strengthens regulatory uptake.

MAGUIRE Julie
Bantry Marine Research Station, Cork, Ireland

A SEA OF RULES: UNLOCKING EUROPE'S SEAWEED POTENTIAL

Seaweed is increasingly recognised as a sustainable marine resource with applications in food, feed, biostimulants, nutraceuticals, pharmaceuticals, and cosmetics. Its ability to absorb nutrients and mitigate eutrophication aligns with EU priorities on food security, decarbonisation, and ecosystem restoration. However, the regulatory framework remains fragmented across environmental, marine, food safety, and agricultural sectors. Divergent national limits for iodine and heavy metals, evolving regulations, and complex approval processes create uncertainty, increase compliance costs, and constrain market growth. Additional challenges include novel food authorisations, restricted health claims, and inconsistent feed regulations. To support sustainable sector growth, greater regulatory harmonisation is needed through standardised licensing, streamlined approval pathways, clearer labelling requirements, and targeted support for compliance testing. Enhanced collaboration between regulators, industry, and researchers will be essential to balance safety, innovation, and market development.

Insect Chemical Ecology

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SENSEAPEST: TOWARDS A PORTABLE ANALYTICAL TOOL FOR EFFICIENT AND NON-INVASIVE DETECTION OF PLANT PESTS

Invasive plant pests and diseases constitute a major threat to food production, forest health and native biodiversity. Import of plant material is one important entry route for these invaders. Currently, effective, affordable and reliable plant inspection measures at points of entry are missing, leaving 97% of imported plant material without phytosanitary assessment. The senseApest project addresses this challenge by exploiting the changes in volatile organic compound (VOC) profiles emitted by plants when under attack by pests. As a proof of concept, VOC profiles from the Brown marmorated stink bug, the Japanese beetle and several *Phytophthora* species attacking agricultural, forest or landscape plants are being collected under different light and temperature conditions. Based on these pest specific profiles, sensor components are developed and combined into a new portable detection unit (PDU). This PDU will consist of a gas module and a liquid module to extend its detection range and include self-learning algorithms to align unknown VOC profiles with existing profiles to indicate the risk for incursions of known and of new, yet chemically undefined plant pests and diseases.

COMTE, A., CABALLERO-VIDAL, G., MONTAGNE, N., MESLIN, C., FIORUCCI, S.,
JACQUIN-JOLY, E.
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ACCELERATING LIGAND DISCOVERY FOR INSECT ODORANT RECEPTORS BY IN SILICO APPROACHES

Odorant receptors (ORs) play a central role in insect olfaction, yet many remain orphan with unknown ligands. Their functional characterization is challenging because of the immense diversity and number of potential ligands, making experimental screening difficult and time-consuming. To address this limitation, we developed two complementary approaches integrating computational and experimental methods. The first approach is ligand-based and uses machine learning models, while the second is structure-based combining 3D receptor modeling with molecular docking. Together, these approaches provide new insights into insect OR function and offer powerful tools to accelerate ligand identification. Ultimately, this work may facilitate the discovery of novel olfactory disruptors for environmentally friendly pest management strategies.

[1]Caballero-Vidal et al (2021) *Cell. Mol. Life Sci.* 78: 6593–6603
[2]Comte et al (2025) In *Olfactory Receptors-Methods and Protocols*. Springer Vol 2915
[3]Comte et al (2025) *Int. J. Biol. Sci.* 21: 2101-2117.

KOUTSOGEORGIOU, E.I.[1,2], KAPRANAS, A.[1], KOULOUSSIS, N.A.[1], ***ANDREADIS, S.S.[2]***
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BEHAVIORAL RESPONSES OF *HALYOMORPHA HALYS* TO PHENOLOGY-SPECIFIC VOLATILE BLENDS

The brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae), is an invasive, highly polyphagous pest that relies on plant volatile organic compounds (VOCs) to locate and select suitable host plants. In this study, VOC emissions from kiwifruit (*Actinidia chinensis* var. *deliciosa*) were characterized at three phenological stages using headspace collection followed by gas chromatography–mass spectrometry (GC-MS). Antennally-active compounds were identified through gas chromatography coupled with electroantennographic detection (GC-EAD), revealing stage-specific volatile profiles and differences in the insect's olfactory responses. Based on the chemical composition of each phenological stage, synthetic volatile blends were created and evaluated in Y-tube olfactometer assays to investigate the behavioral responses of adult *H. halys*. The behavioral assays demonstrated differential attraction to the stage-specific synthetic blends, indicating that seasonal changes in host plant volatile emissions influence host selection. These findings provide new insights into the chemical ecology of *H. halys* and highlight the importance of dynamic plant volatile cues in mediating host-finding behavior.

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MALE-SPECIFIC LACTONE ENHANCES ATTRACTION OF BOTH SEXES OF *Bactrocera oleae* TO AMMONIUM BICARBONATE

Bactrocera oleae (Rossi) (Diptera: Tephritidae) is the most important pest of olive trees worldwide. Even though the intraspecific chemical communication of *B. oleae* has been subjected to vast research during the last decades, its chemical communication remains poorly understood. We report for the first time two male-specific volatile compounds, γ-hexalactone and δ-hexalactone, identified in laboratory-reared males but absent in females. Behavioral assays showed that γ-hexalactone attracted both virgin males and females, whereas δ-hexalactone showed no attractiveness. Field trials demonstrated that traps baited with ammonium bicarbonate plus γ-hexalactone captured significantly more flies of both sexes than traps baited with ammonium bicarbonate alone or combined with the major pheromone component, 1,7-dioxaspiro[5.5]undecane. These findings reveal a previously unknown component of *B. oleae* chemical ecology and highlight γ-hexalactone as a promising candidate for improving mass-trapping strategies.

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WHAT DICTATES DIVERSITY IN CHEMICAL DEFENCES OF ITHOMIINI BUTTERFLIES?

Chemical defences are widespread and remarkably diverse, playing a central role in shaping predator-prey interactions. Yet unlike traits such as colour pattern, relatively few studies have examined the ecological and evolutionary processes driving variation in chemical diversity and composition. Here I address this question using the brightly coloured, chemically defended Neotropical butterflies of the Ithomiini tribe. Both abundant and species-rich, Ithomiini have diversified in close association with their Solanaceae hostplants, but are best known for sequestering pyrrolizidine alkaloids from flowers of Boraginaceae and Asteraceae. Geographic variation in the availability of these plant-derived precursors, together with differences in predator communities and mimicry rings, may drive local adaptation in chemical composition and ultimately influence species divergence and distributions. Here I present evidence for the role of plant resources, conspicuousness, and predator pressure in mediating interactions, and discuss ongoing work aimed at uncovering the ecological and evolutionary drivers of diversity in chemical defence across this remarkable butterfly radiation.

Chemical Communication in Different Biological Systems

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COMMUNICATING IN THE DARK: CHEMICAL SIGNALS IN SUBTERRANEAN REPTILES

Chemical perception is the dominant sensory modality in subterranean environments, where the absence of light makes visual cues of little use and chemical information essential for survival and communication. We present an overview of our research on chemical communication in amphisbaenians, a poorly known group of fossorial reptiles that provides an excellent model for studying chemical signaling in subterranean vertebrates. Using chemical analyses and behavioral experiments, we investigate the role of chemical signals in conspecific and individual recognition, social interactions, dominance, and mate choice, as well as the effects of habitat degradation, pollution, and climate change on these communication systems. Our work integrates behavioral and sensory ecology with ecophysiology and conservation biology to understand the evolution and ecological significance of chemical communication underground. Finally, we highlight future directions, including the identification of semiochemicals, microbiome-mediated signaling, and the impacts of global change on subterranean biodiversity.

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CHEMICAL LANGUAGE IN MAMMALIAN SIGNALLING

The chemical composition of odorous secretions in mammals is important to decipher species, individuality, sex, and physiological states including hygiene, health, and estrus. In recent years, we studied this chemical language in African mole rats, mice and ungulates and all these unrelated species have specific profiles with some overlaps on the level of metabolites. However, they share one common feature, that is, none of the species have one or few molecules that represent, for instance, physiological states but instead many molecules represent these states in combination. This is seen in mole rat perioral secretions where reproductive status is revealed by many molecules that are clearly statistically discriminated. Similarly in mice, reproductive and individual status are represented by combinations of molecules thus revealing specific signature mixtures. In ungulates, there are specific mixtures that clearly discriminate species, sex, and individuals. To conclude, our findings skew the traditional concept of pheromones and opens the perspective of odor profiles as combinatorial n-dimensional hyper-space.

DONG, L., ABEDINI, D., WANG, K., AMBEKAR, A., GUERRIERI, A., WHITE, F., YANG, Y., MARIO SCHILDER, M., VLAAR, L.E., BERTRAN, A.M., GOVERSE, A., BOUWMEESTER, H.

Plant Hormone Biology Group, Amsterdam, The Netherlands

CHEMICAL SIGNALLING IN PLANT-MICROBE-NEMATODE INTERACTIONS

Plants actively shape rhizosphere function through root-derived chemical signals that structure microbial communities, regulate nutrient cycling, and mediate biotic interactions. We investigate solanoeclepin A (SolA), a key hatching factor for potato cyst nematodes, to address why plants release metabolites that can be exploited by parasites. We show that SolA production depends on a coordinated plant–microbe process under non-sterile conditions and is strongly regulated by nitrogen availability. Integrated transcriptomic, metabolomic, and genetic analyses identify plant cytochrome P450 enzymes as candidate components of SolA biosynthesis. Multi-omics integration further links SolA accumulation with plant growth-promoting bacteria that enhance performance under nitrogen limitation. Together, our findings support a model in which SolA functions as part of a plant–microbe chemical language shaped by nutrient stress and microbial recruitment, but inadvertently exploited by cyst nematodes. This work provides a framework for sustainable nematode management and improved nutrient-use efficiency in potato systems.

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VOLATILOMES IN THE INTERPLAY AMONG PEPPER PLANTS, A PLANT GROWTH PROMOTING BACTERIAL STRAIN, AND *Verticillium dahlia*

Plants interact with their neighbors in diverse ways by attracting symbionts, deterring or even eliminating enemies, while interactions among microorganisms inhabiting the phyllosphere and rhizosphere further affect the outcome of these interactions. However, the contribution of headspace VOCs to these processes remains largely unknown. In this context, the volatilome of the novel plant growth-promoting (PGP) strain Chryseobacterium sp. SAESo14 and its role in interactions with the soilborne pathogen Verticillium dahliae and pepper plants were investigated. First, volatiles from SAESo14 and V. dahliae co-inoculated in dual cultures were analyzed by Gas Chromatography-Mass Spectrometry (GC–MS) coupled with In-Tube Extraction Dynamic Headspace (ITEX-DHS). A diverse array of VOCs, including alcohols, ketones, esters, and sulfur-containing compounds were detected. To further investigate the role of VOCs in tripartite interactions, volatilomes of a pepper - V. dahliae pathosystem treated with SAESo14, were analyzed. Seedlings treated with SAESo14 exhibited enhanced terpenoid metabolism, with derivatives such as cineol, elemene and sclarene being detected.

KLOOP, A., BALTHAZAR, E., LIEGOIS, S., GRITTI, E., SAUZE, J., PIEL, C., DEVIDAL, S., LAPEYRE, B., BUATOIS, B., KJELLBERG, F., NICOLÉ, F., ***PROFFIT, M.***

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EFFECTS OF OZONE POLLUTION ON PLANT-POLLINATOR CHEMICAL COMMUNICATION UNDER CLIMATE CHANGE: THE CASE OF THE MEDITERRANEAN FIG TREE AND ITS SPECIALIZED POLLINATOR

Anthropogenic environmental changes constitute a real threat to pollination and associated ecosystem services. Among these changes, atmospheric ozone (O_3) pollution alters floral volatile organic compounds (VOCs), which are essential for pollinator attraction and floral recognition. Due to its strong oxidizing properties, ozone can also affect the physiology of both plants and pollinators, disrupting VOC emission and perception. Rising temperatures associated with climate change may further intensify these effects. This study investigated the combined impacts of ozone pollution and increased temperature on the chemical communication between the Mediterranean fig tree and its specialized pollinator. Experiments were conducted in mesocosms at the European Ecotron in Montpellier under realistic ozone peaks (120 ppb) and a temperature increase of +3°C, applied separately and together. Results showed that a 3-hour exposure to either or both stressors reduced pollinators' antennal sensitivity to floral VOCs, while also decreasing their mobility and survival. A 3-day exposure also altered VOC emissions from fig inflorescences, with effects persisting for at least 24 hours after treatment.

POSTERS

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POSTER ABSTRACTS

(Poster numbers for poster session page 55)

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DOES AUTOTOXICITY AVOIDANCE SHAPE ORGAN-SPECIFIC CHEMODIVERSITY? SOLANACEAE DITERPENE GLYCOSIDES AND GLYCOALKALOIDS AS CASE STUDIES.

Chemical defense against herbivory is a major selective force shaping specialized metabolism in plants. In the Solanaceae, hydroxygeranyllinalool diterpene glycosides (HGL-DTGs) and steroidal glycoalkaloids (SGAs) serve as potent anti-herbivore defenses, yet accumulation of biosynthetic intermediates in plant tissues causes autotoxicity in the producing plant itself. This autotoxicity constraint is expected to drive chemodiversity and the distribution of specialized metabolites within the plant. Yet, the organ-specific distribution of SGAs and HGL-DTGs has never been systematically described, leaving a critical gap in our understanding of how plants manage this ecological cost-benefit trade-off. Using a comparative mass spectrometry-based approach across seven Solanaceae species, we mapped organ-specific distribution and chemodiversity of both compound classes. We reveal SGA-related compounds previously restricted to Solanum in *Nicotiana glutinosa*, and strong tissue-dependent modulation of chemodiversity in both classes, suggesting autotoxicity protection is linked to organ context.

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IDENTIFICATION AND FUNCTIONAL ANALYSIS OF TERPENE SYNTHASES FROM *LAVANDULA SPECIES*

Lavender essential oil composition is determined by terpene synthases (TPSs), yet many enzymes remain functionally uncharacterized. Candidate TPS genes from *Lavandula angustifolia* and *Lavandula × intermedia* were selected for functional analysis. Recombinant proteins were produced in *Escherichia coli*, and transient expression in *Nicotiana benthamiana* was used to investigate enzyme activity. GC–MS analysis of volatile metabolites demonstrated distinct terpene product profiles among the TPSs, highlighting their functional diversity. This work provides new insights into terpene biosynthesis in *Lavandula* species and establishes a foundation for future studies on enzyme specificity and terpene metabolic engineering.

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PYRAZOLE-MODIFIED CHITOSAN SCHIFF BASES AS BIO-BASED FUNCTIONAL MATERIALS FOR WATER TREATMENT APPLICATIONS

Pyrazole-modified chitosan Schiff bases are promising bio-based materials for water-treatment applications owing to the adsorption capacity of chitosan and the functional properties of the pyrazole moiety. The incorporation of pyrazole functionalities may enhance their potential as environmentally friendly adsorbents and antimicrobial materials for water purification applications [1,2].

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ZAMBONI, C.[1], *RASMANN, S.[2], GOSSNER, M.[1,3], BOLLIGER, J.[1], EISENRING, M.[1]*
[1]: Forest Health and Biotic Interactions, Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland; [2]: University of Neuchâtel, UniNE, Neuchâtel, Switzerland; [3]: Institute of Terrestrial Ecosystems, ETH Zürich, Zurich, Switzerland

EFFECTS OF ARTIFICIAL NIGHT LIGHT COLOUR ON PHYTOCHEMISTRY AND ITS IMPLICATIONS FOR PLANT–INSECT INTERACTIONS

I will provide an outlook onto my first experiment which tests whether light spectrum alters constitutive and herbivore-induced plant chemistry, and whether these shifts translate into changes in insect performance and feeding preference.
To answer my questions, three plant species (*Plantago lanceolata*, *Trifolium repens*, and *Brassica napus*) will be exposed to red, blue, green and white night light or a dark control. All plants will be induced by caterpillars which will allow me to measure defence induction responses under ALAN. I will measure ALAN effects on volatile and non-volatile leaf chemistry and caterpillar performance on ALAN treated plants will be quantified. Finally, I will conduct a leaf disc choice experiment with caterpillars comparing plants grown under non-ALAN vs. ALAN-exposed plants. My experiment is executed in close collaboration with the Swiss energy supply company, Elektrizitätswerke des Kantons Zürich (EKZ) and will contribute to the development of optimised, plant and insect friendly outdoor lighting strategies.

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ENHANCED ANAMMOX BIOFILM-MEDIATED NITROGEN AND PHARMACEUTICALS REMOVAL UNDER ANOXIC CONDITIONS

This study evaluated a pre-acclimatized anammox biofilm MBBR for treating nitrogen and pharmaceutically active compounds (PhACs) over 550 days. The system achieved a peak total nitrogen removal efficiency (TNRE) of 93% and a removal rate of 0.65 kg N m^{-3} d^{-1}.In batch tests, adding hydrazine (N_2H_4) under anoxic conditions increased TNRE from 58% to 84%. Hydrazine also stimulated the efficient degradation of specific PhACs, removing 99% of atenolol and 78% of citalopram. 16S rRNA genes surged from ~0% to 14%, shifting the community from heterotrophic to autotrophic. The abundance of the *nirK* gene decreased by 50%, whereas the nirS gene abundance increased by approximately 31%. Ultimately, hydrazine (N2H4) mediated anammox systems offer a sustainable, low-energy blueprint for simultaneous nitrogen and pharmaceutical wastewater treatment. This positions hydrazine-enhanced anammox technology as a powerful, cost-effective breakthrough for modern municipal and pharmaceutical wastewater treatment.

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VOLATILE CUES, RATHER THAN VIRULENCE ALONE, DETERMINE BELOWGROUND ENTOMOPATHOGENIC FUNGI EFFICACY AGAINST WIREWORMS.

Biocontrol efficacy in soil usually relies on pathogen virulence, yet host location precedes host killing, and insects generally evolve to avoid pathogen-associated cues. We tested whether volatile emission, not virulence alone, determines entomopathogenic fungi (EPF) efficacy against wireworms (*Agriotes* spp.), comparing three strains (entomopathogenic: MANEW, OARV; non-entomopathogenic: TH) encapsulated in alginate beads via virulence assays (in vitro, soil microcosms), dual-choice olfactometry, and TD-GC-MS volatolomics. OARV, most virulent in vitro, lost efficacy in soil and elicited no directional response, its profile was dominated by low-specificity compounds, common to soil. MANEW, in contrast, remained efficient in soil and triggered significant attraction, its profile enriched in sesquiterpenes evoking root-associated terpenoid signals. This suggests that its efficacy may be linked to the use of belowground chemical detection

pathways rather than avoidance. TH, non-pathogenic, elicited even stronger attraction via ubiquitous oxylipins. Virulence and recruitment capacity thus appear as dissociable traits requiring co-optimization for effective biocontrol design.

MOLDOVAN, Anna

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NATIVE STRAINS OF FUNGI AS DUAL CONTROL AGENTS AGAINST PESTS

Crop losses and reduced product quality caused by pests are significant challenges in modern agriculture. Environmental and health concerns associated with synthetic pesticides urge the need for safe and effective pest control. Entomopathogenic fungi are a promising approach for managing harmful insects, with selected strains also exhibiting antagonistic activity against plant pathogens. Native strains are particularly promising candidates for developing biopesticides for dual control, given their increased adaptability to local environments. Recently isolated native entomopathogenic fungal strains have been characterized being active against *Hypera postica*, *Leptinotarsa decemlineata*, *Sitona lineatus*, and other insect pests under laboratory conditions. The most virulent strains were evaluated for their efficacy against the phytopathogenic fungi *Alternaria alternata* and *Fusarium oxysporum*. Results indicate variable anti-phytopathogenic potential, with percentage inhibition of radial growth reaching up to 70%. Future studies will focus on formulating these strains for field applications.

KAVALLIERATOS, N.G., GIDARI, D.L.S., BOUKOUVALA, M.C., FILINTAS, C.S., SKOURTI, A., ***KYRPISLIDI, V.P.C.****, NTINOKAS, D., SPINOZZI, E., PETRELLI, R., MAGGI, F.*

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EFFICACY OF MYRRH ESSENTIAL OIL AS A GRAIN PROTECTANT AGAINST MAJOR INSECT AND MITE PESTS

Botanical insecticides are being investigated as alternatives to stored-grain pest infestations, since the extensive use of synthetic insecticides is related to resistance of pests and progressively meet strict application regulations. This research evaluated the essential oil (EO) from *Commiphora myrrha* against three key wheat storage pests: *Acarus siro*, *Trogoderma granarium*, and *Rhyzopertha dominica*. Wheat kernels were treated with 500 and 1000 ppm of *C. myrrha* EO alongside a synthetic insecticide at the label concentration of 5 ppm (positive control). Over seven days, the EO exhibited variable efficacy depending on the pest species and life stage, often outperforming the positive control. Adults of *T. granarium* demonstrated the highest susceptibility with complete mortality, while *A. siro* adults achieved approximately 78% mortality. Moderate effectiveness was documented against *R. dominica* adults and *A. siro* nymphs, though *T. granarium* larvae proved highly tolerant. The dual acaricidal and insecticidal properties of the

tested EO make it a promising natural component for integrated pest management strategies.

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PLANT–HERBIVORE INTERACTIONS ARE MORE DYNAMIC THAN WE MEASURE

Plant–herbivore interactions are dynamic processes shaped by continuous changes in herbivore behavior, plant signaling, metabolism, and environmental conditions. However, studies on induced plant defenses frequently overlook dynamics and their explicit role in plant-herbivore systems; even following a systematic review explicitly aimed at retrieving studies that consider response dynamics, more than half of the studies retrieved (n = 473) only measured induced defenses at only a single time point. We suggest that the lack of explicit consideration of timing in experiments limits of understanding of how plants deal with herbivory in terms of metabolic costs, ecological function, intrinsic regulation, and herbivore pressure. We argue that understanding these dynamics is essential for comprehending the broader picture behind the production and emission of chemical defenses, as herbivory is inherently dynamic. By explicitly incorporating temporal dynamics into plant-herbivore interactions research, we can better understand plant–herbivore interactions and improve predictions of ecological responses in changing environments.

KIRALJ, Z., *LAJTNER, J., ŽGANEC, K., MIJOŠEK PAVIN, T., FALCONNAT, N., GRAULUS, L., VALIĆ, D., BARIŠIĆ, J., REBOK, K., RISTOVSKA, M., DRAGUN, Z.*
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ACCUMULATION OF SELECTED METAL(LOID)S IN THREE FRESHWATER ORGANISMS OCCUPYING DIFFERENT TROPHIC LEVELS

To investigate trophic patterns of metal(loid) accumulation, three freshwater species representing different trophic levels — mussel *Corbicula fluminea*, gammarid *Gammarus fossarum* complex, and fish *Squalius cephalus*—were collected from the same site in the Mura River (Croatia). Concentrations of selected trace elements were determined by ICP-MS in whole soft tissue, whole specimens, and liver, respectively. The highest concentrations of Cr, Ni, Pb, and W were measured in *G. fossarum*, followed by *C. fluminea*, while *S. cephalus* exhibited the lowest concentrations, suggesting preferential accumulation of these particle-associated elements in benthic invertebrates and limited dietary assimilation and retention in fish. In contrast, *S. cephalus* contained the highest concentrations of Mo, Se, and Zn, consistent with their essential roles in vertebrate metabolism and homeostatic regulation. *C. fluminea* accumulated the highest concentrations of As and Cd, likely

due to efficient filter-feeding uptake of both elements, and high affinity of Cd for metallothioneins in bivalves. These findings demonstrate that metal(loid)s accumulation is driven by both trophic position and species-specific physiology.

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METAL ACCUMULATION AND BIOMARKER RESPONSES IN DIGESTIVE GLANDS OF FARMED AND WILD *MYTILUS GALLOPROVINCIALIS*

Trace metals are widespread contaminants that accumulate in marine organisms and may induce sublethal biological effects. This study compared metal accumulation and biomarker responses in the digestive glands of farmed and wild *Mytilus galloprovincialis* from the Šibenik Bay (Middle Adriatic Sea). Total metal concentrations were determined by ICP-MS, while catalase (CAT), glutathione S-transferase (GST), malondialdehyde (MDA) and metallothioneins (MTs) were analysed spectrophotometrically. Farmed mussels had higher concentrations of Co, Mn, Ni and V, while wild mussels accumulated higher concentrations of As, Ba, Cd, Cu, Fe, and Sn, indicating differences in contamination sources between locations. Activities of CAT and GST were significantly higher in digestive glands of farmed mussels, while MDA levels did not differ significantly between the two groups, suggesting effective antioxidative defense. Metal homeostasis and detoxification directly influence MTs, which provide additional insight into the metal exposure conditions. These findings highlight the importance of integrating chemical and biological markers for assessing contaminant-induced stress in marine ecosystems.

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DoE-OPTIMIZED FISH OIL NANOSTRUCTURED LIPID CARRIERS FOR ENHANCED ORAL CARVEDILOL DELIVERY IN MYOCARDIAL INFARCTION

Cardiovascular diseases (CVDs), particularly myocardial infarction (MI), remain the leading cause of mortality worldwide[1], driving the need for improved oral drug delivery systems[2]. Fish oil-based nanostructured lipid carriers (NLCs) encapsulating carvedilol (CRV) were developed and optimized using a Design of Experiments (DoE) approach with a Central Composite Design (CCD). The optimized formulation showed excellent physicochemical properties, including high encapsulation efficiency (96.0%) and drug loading (13.9%), with good colloidal stability. Compared with free CRV, NLCs markedly enhanced drug release (79.2% at 1 h and 94.3% at 24 h) while maintaining excellent cytocompatibility in RAW 264.7 macrophages and H9c2 cardiomyoblasts. These findings demonstrate

that DoE-optimized fish oil-based NLCs are a promising oral nanoplatform for improving carvedilol delivery in MI.

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OTHER ABSTRACTS

(by presenter name alphabetical order)

(Poster numbers for poster session page 55)

ANASTASAKI, E., *PSOMA, A., LYTRA, I., PAPACHRISTOS, D., MILONAS, P.*
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SEX PHEROMONE COMPOSITION OF *SPODOPTERA FRUGIPERDA* IN GREECE

Since 2019, the polyphagous fall armyworm (FAW), *Spodoptera frugiperda* (Lepidoptera: Noctuidae), has been listed as a priority pest in the European Union because of its high invasion potential and the significant threat it poses to European agriculture[1]. It was first detected in mainland Europe in 2023, with occurrences in several regions of Greece[2]. Pheromone traps are widely used for the monitoring and early detection of FAW. However, the performance of commercial lures is often inconsistent. Both pheromone composition and male behavioral responses exhibit geographic and host-strain variation[3,4], highlighting the importance of optimizing pheromone blends under local conditions, particularly in newly invaded areas such as Europe. Within the framework of the Horizon Europe project EUFAWREADY, we sample and analyze pheromone gland extracts from FAW populations in Greece to determine the relative proportions of pheromone components of the invasive population and to identify potentially unknown sex pheromone compounds.

[1] EU 2019/2072 [2]EPPO, global database [3]J Chem Ecol 2013, 39,364–376 [4]J Chem Ecol 2024, 50,631–642

DRAGUN, Z., *KIRALJ, Z., FALCONNAT, N., GRAULUS, L., IVANKOVIĆ, D., LAJTNER, J., ŽGANEC, K.*
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DIFFERENCES IN METAL BIOACCUMULATION ABILITY AMONG THREE SPECIES OF FRESHWATER SNAILS

Freshwater snails are often applied as bioindicators of water pollution due to their high ability to accumulate contaminants such as metals. However, various species can exhibit various degrees of bioaccumulation, associated to their particular physiological traits, referring to differences in their breathing, feeding, or other metabolic specificities. In this study, three species (*Viviparus contectus*, prosobranch; *Lymnaea stagnalis* and *Planorbarius corneus,* pulmonates) were collected from the same site, namely the side-channel of the Mura River near the village of Podturen (Croatia), to guarantee the same level of exposure for all

studied species/specimens. Thirty elements were measured by ICP-MS in their whole-soft tissues. The highest concentrations of twenty elements, including highly toxic ones such as Ag, Cd, Tl, and Pb, were determined in the whole soft tissue of *V. contectus*, followed mostly by *L. stagnalis*, and then *P. corneus*. The higher accumulation of metals in *V. contectus* may be related to its longer life span and dual feeding strategy, combining grazing with suspension feeding using its gills, in contrast to pulmonate snails.

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REFINED CUTICULAR HYDROCARBON EXTRACTION METHOD OF PINNED SPECIMENS

Cuticular hydrocarbons (CHC) from insects are often analysed for identification or other purposes. The sample preparation usually entails the total submergence of the insect in hexane with occasional agitation. This may damage the specimens, prohibiting further analysis. This is highly disadvantageous when the specimens need to be returned to a museum collection undamaged. This study therefore focuses on a customised extraction technique adapted to pinned specimens as an alternative sample preparation method and how this can be used in CHC analysis.
A burette was used to slowly drip hexane onto 44 pinned adult blowflies ranging from the years of 2000 to 2022. The extractions were analysed using GC-MS.
The findings show that this extraction technique gave a controlled process of extraction, with uniform drop-size and controllable drop-increments, allowing time to rotate the pinned specimen so that the hexane covered the whole adult body, avoiding morphological damage. Chromatograms show sufficient cuticular hydrocarbons extracted from the samples. The damage done on the flies was very minimal, with only 4.5% of blowflies having a frayed pair of wings.

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BIOCROWN: UNRAVELLING DROUGHT LEGACY EFFECTS ON MULTITROPHIC INTERACTIONS IN FOREST CANOPIES

Drought has lasting impacts on forest ecosystems, yet its long-term effects on species interactions remain poorly understood. Here, I provide first insights into the newly established Weave-funded BioCrown project, which combines canopy crane research, long-term field drought experiments, and laboratory studies to investigate multitrophic interactions and biodiversity in forest canopies. Using the throughfall exclusion experiment in Germany, we examine how drought severity and legacy effects alter leaf chemodiversity and influence bacterial communities, insect herbivory, and herbivore diversity in mature beech crowns. Combining lab

and field approaches, we further assess how drought-induced phytochemical changes in drought-naive and drought-experienced trees affect herbivore preferences, predator–prey interactions, and plant–microbe–herbivore relationships. BioCrown will advance understanding of biodiversity and multitrophic interactions in temperate forests increasingly exposed to extreme drought, providing a European reference for assessing the ecological consequences of repeated drought events.

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PURPEST: EXPLOITING VOLATILE ORGANIC COMPOUNDS FOR PRACTICAL APPLICATION IN PHYTOSANITARY INSPECTIONS AND FIELD ASSESSMENTS

Many plants and plant products require phytosanitary certificates before entering the EU to make sure they have been properly inspected and practically free of pests and diseases. However, these certificates issued by the exporting plant protection authorities often do not describe the actual plant health status, as pests and diseases are difficult to detect. The HEU project PurPest has collected volatile organic compounds (VOCs) produced by several agricultural and forestry plants attacked by different quarantine and other regulated pests and pathogens to develop an extensive plant pest VOC database. A sensor system prototype (SSP), consisting of a pre-concentrator, a µGC, a gradient oven and a Photoionization detector has been developed, fabricated and tested to detect low amounts of these VOCs. In the last year of PurPest, we are testing this SSP under import conditions and promoting its use to reduce the risk of invasive pests and pathogens entering the EU or to detect them in the field for targeted management. Economic and ecological impact studies, cost-benefit analysis and stakeholder webinars are increasing end-user awareness and policy changes to bring science into practice.

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PRELIMINARY INSIGHTS INTO THE CHEMICAL PROFILE OF ALGERIAN BEE POLLEN

This study aimed to investigate the influence of geographical origin, flora and environmental conditions on the chemical composition of bee pollen from Algeria regions. The ethanolic extracts of pollen from Souk El Ténine (P1) and Aokas (P3), two neighbouring regions with similar vegetation, exhibited the highest phenolic contents. In both samples, LC-HRMS/MS analysis identified metabolites previously reported to mediate plant defence and plant–pollinator interactions, including caffeic acid derivatives and flavonol glycosides. In contrast, P1 was characterised by

catechins, myricetin, and quercetin derivatives, whereas P3 contained trigonelline, adenosine, mannitol, and distinctive kaempferol glycosides, reflecting region-specific chemical signatures. These differences suggest that botanical diversity, phenological stage, and environmental conditions may contribute to shaping the chemical profile of bee pollen. Overall, the findings highlight the role of chemical ecology in understanding pollen chemical diversity and its associated biological activities.

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THE USE OF NOVEL ELECTROCHEMICAL SENSORS IN VOLTAMMETRIC MEASUREMENTS FOR MONITORING ENVIRONMENTAL WATERS FOR CONTAMINATION BY TOXIC METAL IONS

Contaminants present in environmental water samples can be broadly categorized into organic compounds, inorganic compounds and metals. Monitoring each of these groups is essential for the comprehensive control and assessment of the composition of these waters. One of the methods of choice for the determination of metal ions is stripping voltammetry. As the chemical reaction underpinning the analytical procedure in this technique takes place at the working electrode, its proper selection is of the greatest importance. Our research has focused on developing new voltametric procedures for the determination of trace amounts of selected metal ions using bismuth film electrodes as an environmentally friendly electrode material. The developed procedures have been successfully applied to the determination of trace amounts of metal ions in environmental water samples, such as river and lake water.

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MIND–BIODIVERSITY: A STRATEGIC HUB FOR NEXT-GENERATION ENVIRONMENTAL RISK ASSESSMENT FOR CHEMICALS

Biodiversity has declined dramatically over the past decades. Yet the contribution of chemical pollution to this decline, as well as its impacts on the stability and resilience of the Earth system, remains insufficiently understood. Current environmental risk assessment (ERA) frameworks aim to ensure environmental protection, but are fragmented across regulations, substance classes, taxa and environmental compartments. Conventional ERAs are limited considering the dimensions of the scope within, for instance, substances, exposure routes, species

and ecological processes. Such biodiversity decline has also direct and indirect effects on human health, as recognised in the One Health framework.
Within PARC (www.eu-parc.eu), the MIND–Biodiversity platform has recently been established as long-term strategic hub to advance next-generation ERA focused on biodiversity-relevant endpoints. It will connect monitoring, modelling, new approach methodologies and field evidence to support more integrated ERAs aligned with the EU Biodiversity Strategy for 2030 and the EU Chemicals Strategy for Sustainability (10.1186/s12302-025-01324-1).

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INTERACTIONS BETWEEN BACTERIAL SYMBIONTS OF ENTOMOPATHOGENIC NEMATODE AND TOMATO PLANTS

Entomopathogenic nematodes (EPN) of the genera *Steinernema and Heterorhabditis,* harboring symbiotic bacteria of the genera *Xenorhabdus* and *Photorhabdus*, parasitize and kill their insect hosts. Recent findings suggest that EPN can influence indirectly neighboring plants by activating direct and/or indirect defenses. Moreover, symbiotic bacteria from EPN interact with plant roots, but their specific role in plants remain largely unexplored. Our aim is to investigate whether these bacteria are involved in plant's functions and metabolism, thereby altering their response to stresses. For this purpose, we evaluated several developmental and physiological characteristics of tomato plants, such as chlorophyll content and CO_2 assimilation under drought and spider mite infestation in the presence of EPN symbiotic bacteria. Our preliminary results suggest that these bacteria influence positively the development of tomato plants, and indirectly lead to suppression of mite populations and their feeding activity. These findings indicate that EPN can have important implications for overall plant health that go beyond their traditional role as biological control agents.

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AMINO-HETEROCYCLES: *N*-ACYLATION AND BIOLOGICAL ACTIVITY

Preliminary antibacterial screening was performed on a series of randomly chosen compounds. Highly promising activity was observed for two 2-(3-chlorophenyl)-*N*-(pyridinyl)acetamides. It was decided to expand the

compounds library and evaluate the antibacterial potential of related 2-(chlorophenyl)-*N*-(heteroaryl)acetamides.
The target molecules were prepared via acylation of amino-*N*-heterocycles. Selection of proper reaction conditions was conducted using 4-aminoisoquinoline a model for N-acylation reaction with 3-chlorophenylacetic acid applying various activating agents. The most effective conditions were applied to the syntheses of remaining target compounds.
All compounds prepared for biological studies were purified to at least 97% purity (LC-MS).X

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MODULATION OF STRAWBERRY AROMA VOLATILES BY EDIBLE COATINGS DURING POSTHARVEST STORAGE

Strawberry (*Fragaria × ananassa* Duch.) is highly valued for its characteristic aroma, which plays a crucial role in consumer preference and fruit quality. Strawberry aroma is a complex trait resulting from the interaction of hundreds of volatile organic compounds, including esters, alcohols, aldehydes, ketones, terpenes, lactones, and furanones. Among these, esters contribute predominantly to the fruity and sweet notes, while compounds such as furaneol and mesifurane are responsible for the distinctive caramel-like and strawberry-specific aroma. Differences in volatile composition were observed among the coating treatments, indicating that edible coatings influenced the retention and formation of aroma compounds during storage. Overall, coating formulations containing CMC, PVA, and natural extracts showed potential for preserving the characteristic strawberry aroma by maintaining a more favorable volatile profile compared with untreated fruit. These findings demonstrate that edible coatings can be an effective postharvest strategy for improving aroma quality and extending the shelf life of fresh strawberries.

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FRUIT POMACE AS A POTENTIAL SOURCE OF BIOACTIVE COMPOUNDS: AN ENVIRONMENTALLY FRIENDLY EXTRACTION APPROACH

The valorization of fruit pomace (rich in bioactive compounds) as a secondary raw material, guided by circular economy principles, has become an attractive topic in recent years.
Our study presents a novel extraction approach using "greener" solvent variants (as opposed to conventional methanol) to extract anthocyanins from berry pomace samples, and determination of antioxidant capacity of the obtained extracts. New

hydrophilic solvents were prepared using choline chloride, choline dihydrogen citrate, and sodium acetate (H-bond acceptors) and glycerol and polyethylene glycol (H-bond donors); their efficiency was tested and compared to that of methanol (performed on the same samples), followed by quantification using UV/VIS spectrometry. The results showed higher extraction efficiency using the tested solvents and a greater antioxidant capacity of the obtained extracts compared to methanolic extracts. This innovative approach could represent a promising extraction tool that can significantly reduce the environmental impact of the food industry.

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COMPOSITE BIOPOLYMER MICROPARTICLES AS CARRIERS FOR PLANT GROWTH-PROMOTING RHIZOBACTERIA

Effective microbial delivery systems are crucial for enhancing the stability and field performance of plant growth-promoting rhizobacteria (PGPR). In this study, *Pseudomonas brassicacearum* was encapsulated into composite biopolymer microparticles using ionic gelation with biodegradable natural polymers to achieve controlled bacterial release and improved viability. FTIR, OM, SEM, AFM, and UV–Vis spectroscopy were employed to characterize polymer interactions, morphology, surface properties, and release behavior. The developed microparticles exhibited a homogeneous spherical structure, efficient bacterial immobilization, and gradual bacterial release, demonstrating their potential as time-release carriers. These composite biopolymer microparticles provide a promising approach for sustainable microbial inoculants by enhancing bacterial protection, rhizosphere colonization, and environmentally friendly agricultural applications.

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AN INNOVATIVE AND VERSATILE DESIGN FOR ION-SELECTIVE ELECTRODES FOR MONITORING VARIOUS IONS IN NATURAL WATERS

Ion-selective electrodes enable the rapid, cost-effective, and selective determination of the concentrations of numerous inorganic and organic ions in water, soil, and air samples.

This paper presents an innovative design for solid-contact ion-selective electrodes (SCISEs) that do not require an internal electrolyte solution. These new SCISEs were fabricated using an innovative electrode substrate: an array of gold microelectrodes consisting of several hundred individual microelectrodes. This approach was combined with established membrane systems, with the membrane applied directly onto the surface of the substrate electrode. The study demonstrated that,

despite the absence of additional solid-contact material the ISEs based on gold microelectrode arrays exhibited excellent analytical performance. Each sensor showed significantly improved stability, reversibility, and reproducibility of the electrode potential compared to electrodes using a glassy carbon disk substrate. The use of this innovative electrode substrate simplified and accelerated sensor fabrication while maintaining high performance and signal stability.

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DIVERSITY OF MACROINVERTEVRATES PHEROMONES ALONG THE SMALL FRESHWATER STREAM IN SERBIA – A CASE STUDY

Case study was conducted on small freshwater river "Gradašnica" in Eastern Serbia, at approximately 600 m along water course. Twelve species of macroinvertebrates was recorded in total. Gas Chromatography-Mass Spectrometry (GC-MS) method, together with Solid-Phase Microextraction (SPME) were used to measure volatile compounds. Our research confirmed a hypothesis and showed that differences in habitat conditions along the river (alteration of fast and slow water flow and structure of bottom) cause differences in macroinvertebrate structure, and, consequently, changes in pheromone types and amount, both species-specific and shared by different species.

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