

22nd Meeting of the International Humic Substances Society Rimini, Italy • 25-30 August 2024



The role of NOM and HS in achieving Sustainable Development Goals

Programme and Abstracts

Welcome to IHSS 2024

Dear colleagues, dear friends,

on behalf of the Organizing Committee, we would like to heartfeltly welcome you to the 22nd International Conference of the International Humic Substances Society (IHSS 2024).

The IHSS 2024 Conference will be held on August 25-30, 2024, in the city of Rimini, located in a wonderful region of the Northern Italy where natural, historical and cultural patrimonies characterize a unique and unforgettable atmosphere.

The Conference is organized by the Italian Chapter of the IHSS, with the contribution of several colleagues and collaborators.

The scientific structure of the IHSS 2024 Conference includes various fields of interest of our community, declined and oriented towards the Sustainable Development Goals of the United Nation Agenda 2030, with the purpose of contributing to accelerate and complete the expected achievements. Topics like the impact of climate changes on terrestrial and aquatic natural resources, the chemical and biological transformation of pollutants in the environment, the biowaste recycling and management, together with novel scientific and technical frontiers appear in the scientific programme. Further, a large space is devoted to the growing connections between scientists and private companies.

It is a great pleasure to organize this event on behalf of our international community and partnerships and to host researchers, professionals, students coming from academy, research institutions and companies worldwide and to create a stimulating and exciting atmosphere for sharing the results of their scientific activities.

The IHSS 2024 Organizing Committee

Prof. Claudio Ciavatta | University of Bologna (President) *Prof. Teodoro Miano* | University of Bari, CIHEAM Paris *Prof. Claudio Zaccone* | University of Verona

Organizing Committee

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A Unique Business Model

TIMAC AGRO Italia, part of the French Roullier Group, is a leader in innovation in the fertiliser and biostimulant sector, with two production plants in Italy: in Ripalta Arpina (CR) and Barletta (BT). For over thirty years, the company has established a significant presence in Italy through a distinctive business model based on a widespread network of Technical Sales Agronomists (ATCs) who assist farmers with customised nutritional strategies. In every corner of agricultural districts, the ATCs promote good agronomic practices and optimise nutrition using TIMAC AGRO's special fertiliser lines, enhanced by exclusive and patented technologies.





Nature-Inspired Technologies

To support the ecological transition in agriculture, the company works to develop technologies inspired by nature that are increasingly capable of enhancing product efficiency and reducing raw material consumption, ensuring the full expression of the genetic potential of the plants to be nourished. The development of technological products also aims to provide Italian farmers with innovative and highperformance tools to meet the new challenges of quality and productivity.

Research Partnerships

Evidence of the company's continuous and structural drive for innovation includes numerous partnerships with universities and research centres in Italy and Europe, along with projects undertaken to study and integrate circular economy models in the fertiliser sector, which have already led to the creation of new product lines. In addition to the synergies developed nationally, the Roullier World Innovation Centre – the largest private research centre in Europe in nutrition, exclusively owned by the Group – plays a supportive, coordinating, and enhancing role in the research activities of TIMAC AGRO subsidiaries worldwide.



Our Vision for the Future of Agriculture

The synthesis of resource use, investment planning, and technological orientation is the guiding principle of the company's strategy. Now more than ever, we feel the strong responsibility to grow and innovate for the true progress of agriculture, starting with nutrition, which is its essential and indispensable foundation.



The Hera Group is one of the leading multiutility companies in Italy: it offers **4.2 million citizens** sustainable management of multiple **public services in 311 municipalities** spread across five Italian regions (Emilia-Romagna, Veneto, Friuli-Venezia Giulia, Marche and Tuscany). The Hera Group provides **energy** (distribution and sale of gas and electricity), **water** (aqueduct, sewerage and purification) **and environmental services** (waste collection, recycling and treatment) to citizens and businesses. The **Hera Group** confirms its position as one of the leading operators at national level in all the businesses in which it operates, placing it, compared to other listed companies:

1st operator in the environmental sector in terms of waste treated

2nd operator in the water cycle in terms of volumes of water supplied

- **3**rd operator in the gas and electricity sales business in terms of number of customers
- 4th operator in the gas distribution business in terms of volumes supplied
- 5th operator in the electricity distribution business in terms of volumes distributed
- 5th operator in the public lighting business in terms of number of lighting points managed.

The company AresGas, controlled by AcegasApsAmga, provides methane gas distribution and electricity sales services to about 28 thousand customers in Bulgaria. The Group is also present in other European countries through its subsidiary Aliplast with its own plastic recycling plants. In the organic waste sector, Herambiente (a Hera Group company) operates through its 6 composting plants, 5 of which have an anaerobic digestion section for the production of biogas and biomethane. The collection of about 370,000 tonnes of organic waste produces about 60,000/70,000 tonnes of soil improvers that are sold to local farms and 1,500/2,000 tonnes of liquid ammonium sulphate destined for the fertiliser industry. Similarly, the production of approximately 140,000 tonnes of urban sewage sludge is transformed into soil conditioners that are also sold to farms in the areas surrounding the plant sites.

Since 2008, our organic fertilisers have been tested in the various territories, soils and crops of Emilia Romagna through an experimental project with the Alma Mater Studiorum University of Bologna. The in-depth studies have concerned both quantitative and qualitative production results as well as the impact on the soil-plant system.

https://ha.gruppohera.it/





Il **Gruppo Fratelli Visconti** investe da anni in agricoltura, ambiente ed energia.

Le Società che fanno parte del *network* del Gruppo costituiscono un sistema diversificato di settori altamente strategici per l'erogazione di servizi rivolti a soggetti sia pubblici che privati: recupero di biomasse in agricoltura, trasporti e logistica, laboratori specializzati di analisi, ricerca e sviluppo di processi innovativi, sfruttamento di energie rinnovabili.

Guidato dai tre fratelli *Visconti,* il Gruppo coinvolge un *team* altamente specializzato, che coniuga esperienze professionali consolidate a nuove giovani figure di riferimento e vanta collaborazioni con i migliori atenei, centri di ricerca e *cluster* italiani.



Evergreen Italia opera in Lombardia nel territorio della Lomellina (PV), storicamente a vocazione agricola, offrendo un servizio altamente specializzato di 'pubblica utilità' e qualificandosi come *player* nel settore della *Bio-based Economy*, in linea con i principi della *bioeconomy* offrendo vie concrete per lo sviluppo di un modello economico circolare.



STRATEGY E MISSION DEL GRUPPO

Forte della propria esperienza trentennale maturata nel settore del recupero di biomasse in agricoltura e della costruzione di un modello virtuoso di erogazione del servizio dal produttore al consumatore, il Gruppo ha sviluppato tecnologie all'avanguardia e si è imposto di acquisire sempre maggiori competenze per esercitare un ruolo di massimo rilievo nel nuovo panorama della finanza green in linea con le moderne politiche europee ed italiane del new deal green. La missione è dunque creare valore ed innovazione. Ad esempio, grazie alle 100 aziende agricole convenzionate, su circa 10.000 ettari, dalla nascita del Gruppo sono state recuperate in agricoltura quasi 3 milioni di tonnellate di biomasse con l'apporto di importanti nutrienti come Azoto, Fosforo e Potassio, che altrimenti sarebbero andati perduti.

INVESTIMENTI E PROGETTI PIÙ RECENTI

La Società ha sviluppati numerosi progetti di ricerca e brevetti, fra i quali è stato concepito un processo per convertire la CO₂ in fertilizzante in un'ottica di **CS e CCU – "Carbon Storage e Carbon Capture and Utilization",** ed è stata attivata una moderna **Piattaforma digitale 'Ginevra'** per poter tracciare il totale dei quantitativi annui di biomasse idonee al recupero agricolo e gestire, attraverso una concimazione a rateo variabile, tutti i prodotti in uscita dai siti di trattamento.



The company Organazoto Fertilizzanti S.p.A. with its main production plant located in the town of Ponte a Egola, Tuscany, Italy, ranks among the leading European producers of organic, organo-mineral fertilisers and soil improvers.

Organic fertilisers produced from natural sources use some of the most innovative and effective animal and plant-based organic protein materials for agricultural purposes.

Using a thermo-baric hydrolysis process at high temperature (approx. 150-160 °C) and pressure (4-5 bars) without the addition of synthetic components, solid nitrogenous organic fertilisers are obtained. These fertilisers are health safety and are in the top class in the organic fertiliser sector.

The main types of organic fertilisers obtained are:

- Hydrolysed gelatin for agricultural uses
- Hydrolysed leather and hides.

We are proud to point out that Organazoto's start of business dates back to 1977 and thus came many years ahead of the concept of the 'circular economy', which is widely cited today also at the European level, and which enabled the enactment of the Fertiliser Regulation (EU) 2019/1009.

It was clear to Organazoto even then that the recycling and reuse of organic protein matrices would benefit nature and agriculture in general.

Today, technological developments and the need for environmental protection have motivated Organazoto even more strongly to expand into European and international markets.

These prospects have led to the recent construction of a new production plant in North Africa (Algeria) that will contribute to the development of the Organazoto industrial project.

Via della Spira, 26 56024 Ponte a Egola (PI) Tel. 0571 497778 - Fax 0571 409195 www.organazoto.it - info@organazoto.it







Our Origins

Since 1986, Idea Verde has dedicated its activity to the creation of high-quality organic fertilizers based on controlled-release nitrogen through transformation processes of Animal-byproducts (tanned ABPs).

Idea Verde's leading mission is to obtain through its technology the most profitable valorization of materials/waste that, otherwise, can represent a significant environmental impact.

Our Technology

Idea Verde performs a thermo-baric hydrolysis process of ABPs (tanned epithelium waste) and subsequent drying of the resulting material. The first phase of the process involves a stem and pressure treatment of the peptide chains constituting the epithelium, which are thus hydrolysed into shorter chain elements (peptones). The next phase consists of an indirect exchange drying, which uses the steam as a heat-transfer fluid. This technological choice guarantees that the product is treated at lower temperatures (more respectful of the dried material) and that the product is thus free of combustion residues, keeping the constituent organic portion intact.



Idea Verde, which is particularly sensitive towards environmental protection issues, reintroduces into the thermo-baric cycle through a recovery system most of the steam produced during its process. The products resulting from this process (VERDAZOTO® registeredtrademarks) are 100% organic fertilizers that represent one of the best agronomic solutions to answer to crop demands for organic N and C with a single application, guaranteeing efficient mineralization by the soil microbiome, which helps restoring soil fertility.

Under the aegis of





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Accademia Nazionale di Agricoltura





Accademia dei Georgofili





22nd Meeting of the International Humic Substances Society

Programme

Rimini, Italy • 25-30 Augsut 2024

- 17:00 **Registration**
- 18:00-19:30 **Get together**

PROGRAMME · Monday, 26 August

8:00	Registration
8:45-9:15	Opening ceremony
9:15-12:30	Session I: NOM and HS for a sustainable and resilient agriculture
9:15-9:45	Invited speaker
	Bruno Basso <i>Michigan State University, East Lansing, MI, USA</i> Digital twins for assessing and modeling long-term sustainability of agricultural systems
9:45-10:00	Michael H.B. Hayes ⁺ , R.S. Swift Roles of humin in the soil environment
10:00-10:15	D.M. Abreu, <u>Ana Paula D. Turetta</u> Humic substances and their role in food security – a way towards SDGs achievement
10:15-10:30	K. Kieffer, S. Prova, M. Drosos, <u>Angélica Vázquez-Ortega</u> Characterizing and comparing the molecular composition of extractable humic material in an organic farm soil and lake dredged sediments
10:30-10:45	<u>Chunli Wang</u> , Y. Ma, W. He, Y. Kuzyakov, R. Bol, H. Chen, M. Fan Soil quality and ecosystem multifunctionality after 13-year of organic and nitrogen fertilization
10:45-11:15	Coffee break
11:15-11:30	Richard T. Lamar, J. Gralian, A. James, R. Fountain, M.P. Santos, D.B. Zandonadi Ammonia volatilization suppression and N-use efficiency of Urea ^{HS} a new urea/humic substance fertilizer
11:30-11:45	<u>Rossella Curcio</u>, P. Alfieri, P. Mazzei Innovative alginate-based systems to increase soil water retention and enable a slow- release of humic acids, calcium and iron
11:45-12:00	Bhargava Krishna Ganasula, M.C. Della Lucia, G. Bertoldo, M. Borella, P. Stevanato, G. Concheri, D. Gomez, S. Nardi Effects of lignosulfonate-based humic substance applications on morphophysiological traits of <i>Zea mays</i> L.
12:00-12:15	E.T.G. Lima, É.D.S. Sales, R.A. Saraiva, <u>Ramom Rachide Nunes</u> Study on the auxin-<i>like</i> activity of organic compounds extracted from corn waste hydrochar prepared by hydrothermal carbonization
12:15-12:30	Russell Taylor Advancing humic and fulvic acid analysis: a call for collaboration between industry and research

PROGRAMME · Monday, 26 August

12:30-14:00	Lunch IHSS National Coordinators meeting [Sala Orologio]
14:00-17:15	Session II: NOM and HS to fight climate change, land degradation and biodiversity loss
14:00-14:30	Invited speaker
	Heike Knicker Instituto de la Grasa -CSIC, Seville, Spain Pyrogenic organic matter as a tool to achieve a long-term increase of soil organic matter contents?
14:30-14:45	Yakov Kuzyakov, C. Wang, A. Gunina From energy to (soil organic) matter
14:45-15:00	<u>Anna Paesano</u> , M. Mazzon, E. Biagi, E. Musmeci, C. Ciavatta, F. Fava, C. Marzadori
	Organic soil amendments for sustainable vineyard management: effects on soil biochemistry and microbiome
15:00-15:15	Fatma Abdelkefi , B. Giannetta, G. Galluzzi, C. Zaccone Assessing the influence of warming on soil organic matter pools and crop yields
15:15-15:30	Mohammad Rahbari, J. Psutka, B. Black, A. Ajayi Reducing lipid peroxidation caused by drought stress in Canola with fulvic acid
15:30-16:00	Coffee break
16:00-16:15	Yong Li, H. Pan, C. Gubry-Rangin, M.G. Dumont, Z. Jia, J. Xu Impact of microbial interactions on aerobic methanotrophs and methane oxidation activity in soils
16:15-16:30	C. Bravo, M. De Nobili, O. Pedersen, M. Contin, <u>Elisa Pellegrini</u> Influence of increased freshwaters browning on iron plaque formation in hydrophytes
16:30-16:45	Lucas Raimundo Bento, S.A. Schweizer, P.P.A. Oliveira, J.R.M. Pezzopane, A.C. de C. Bernardi The adoption of pasture intensification in a degraded pasture enhances soil organic carbon stocks and cation exchange capacity
16:45-17:00	<u>Tiziana Danise</u> , S.E. Goldoni, M. Dainese, C. Zaccone Influence of land use on soil ecosystems services of mountain grasslands
17:00-17:15	Julianah Adediji, P. Duchesne, N. Scott Moisture controls on soil organic matter quality and decomposability within High Arctic wet sedge ecosystems
17:15-18:30	Poster Session (I-II)

8:00 **Registration**

9:15-12:30 Session III: NOM and HS in the aquatic systems

9:15-9:45 Invited speaker

Diane M. McKnight *Institute of Arctic and Alpine Research, University of Colorado Boulder, CO, USA* A biogeochemical perspective on the reactivity of dissolved organic matter in natural waters: from Antarctica to the Arctic

9:45-10:00 <u>Michel Gad</u>, N. Tayyebi Sabet Khomami, R. Krieg, J. Schor, T. Reemtsma, A. Philippe, O.J. Lechtenfeld

Improved understanding of environmental drivers on DOM composition: a novel correlation-based machine learning and FT-ICR MS approach

10:00-10:15 Rania Mobarak, P. Guth, K. Holger Knorr, M.P. Lau, O.J. Lechtenfeld

Revealing molecular level transformation of dissolved organic matter during electrochemical reduction with liquid chromatography coupled to ultra-high resolution FT-ICR mass spectrometry

10:15-10:30 Yunkyung Lee, J. Hur

Impact of UV-Chlorine oxidation on dissolved organic matter release from microplastics: spectroscopic characterization and brominated disinfection byproduct formation

10:30-10:45 Haeseong Oh, H-Y. Park, M-H. Lee, J. Hur

Predicting total organic carbon in rivers using general water quality parameters: enhancing accuracy with machine learning and fluorescence Indices

10:45-11:15 Coffee break

- 11:15-11:30 <u>Rolf David Vogt</u>, P. Porcal, J. Hejzlar, M.C. Paule-Mercado, S. Haaland, C.B. Gundersen, G.I. Orderud, B. Eikebrokk Distinguishing between sources of natural dissolved organic matter (DOM) based on its characteristics
- 11: 30-11: 45 <u>Carlo Bravo</u>, C. Millo, V. Duarte Moreno, E. de Santis Braga da Graça Saraiva,
 V. Gonsalez Chiozzini, B. Otero Sutti, C. das Mercês Silva, S. Covelli,
 E. Pellegrini, M. Contin, M. de Nobili

Geochemical signatures of sedimentary organic matter in a subtropical freshening coastal environment: a multispectroscopic approach

- 11:45-12:00 A.N. Khreptugova, K.V. Petrov, G.S.Pechnikova, I.P. Semiletov, <u>Irina V. Perminova</u> Imprint of the Siberian Rivers discharge in molecular compositions and optical properties
- 12:00-12:15 <u>Alexander J. Craig</u>, L.W.K. Moodie, J.A. Hawkes Using synthetic chemistry to investigate dissolved organic matter

of dissolved organic matter in the Arctic Shelf seas

PROGRAMME · Tuesday, 27 August

12:15-12:30 Kari E. Norris, F.L. Rosario-Ortiz

Is a supramolecular assembly model necessary to describe the properties and behaviors of dissolved organic matter?

12:30-14:00 **Lunch**

14:00-16:00 Session IV: IHSS travel and Malcom award recipients

- 14:00-14:10 Malcom Award Rakiely da Silva
- 14:10-16:00 *Travel Awards (5 min presentations)*

Mackenzie Bowden • Shelby Buckley • Elli Castonguay • Vinicius Cerveira • Maria Ferreira Vicente • Giorgio Galluzzi • Laura Gismero Rodríguez • Francisco Javier Górriz Nagore • Chen Huang • Kinga Marecka • Thalles Menezes • Suelen Mondek • Oluwatoyin Ogayemi • Itauane Oliveira de Aquino • Michael Osunde • Gabriella Rodrigues • Dyessica Santos • David Sirucek • Di Tong • Sergey Vladimirov • Lidiya Yudina

- 16:00-16:30 **Coffee break**
- 16:30-17:00 **Poster Session (III-IV)**
- 17:00-18:30 IHSS General Assembly

8:45-18:00 Excursion to Urbino–Gradara

8:00 **Registration**

9:15-12:30 Session V: NOM and HS for environmental remediation

- 9:15-9:45 Invited speaker Jianming Xu Institute of Soil and Water Resources & Environmental Science, Zhejiang University, China Achieving safe utilization of Cd-contaminated agricultural soils with biochar and humic acid amendments
- 9:45-10:00 **Fabio Fava** Soil health and restoration: EU priorities and the status of their implementation
- 10:00-10:15Etelvino Henrique Novotny
Low-field NMR for rapid screening of potential adsorbents
- 10:15-10:30 Maria Jerzykiewicz Biochar as NO₂ sorbent
- 10:30-10:45 Nicola Colatorti, C. Porfido, D. Vona, E. Loffredo
 Unteatred agricultural waste of the mediterranean region as bioadsorbent of persistent organic pollutants
- 10:45-11:15 Coffee break
- 11:15-11:30 Marawit Tesfa, A. Dia, K. Hanna, W. Cheng, M. Pedrot, R. Marsac Assessment of the sorptive fractionation of organic matter at the goethite-water interface
- 11:30-11:45 <u>Mónica Antilén</u>, C. Urdiales, L. Caceres-Jensen, J. Simunek Transport and fate of veterinary antibiotics in volcanic soils: experimental and modeling

 11:45-12:00 Giovanna Panza, M. Montanari, D. Lopez, G. Pasini, G. Protano, F. Nannoni, C. Ciacci, S. Burattini, F. Frontalini, D. Sisti, S. Papa, B. Canonico, R. Santolini Assessment of environmental quality through biomonitoring of terrestrial Isopods using cytometric analysis of hepatopancreatic cells of *A. vulgare*

12:00-12:15 **Rupesh Kumar Singh**, J.R. Sousa, H. Trindade Synthesis and characterization of nano-biochar and application on organic matters to improve the nutrients recovery

12:15-12:30 <u>Mikhail Makarov</u>, K.A. Ushakova, G.S. Pechnikova, K.S. Larionov, I.V. Perminova Humics-aminosiloxane polyelectrolyte complexes for anti-erosion treatment of her

Humics-aminosiloxane polyelectrolyte complexes for anti-erosion treatment of hematite-contaminated grounds

12:30-14:00 **Lunch**

PROGRAMME • Thursday, 29 August

14:00-17:15 Session VI: NOM and HS, and waste biomass management in a circular economy scenario

14:00-14:30	Invited speaker
	Roland Bol Institute of Bio- and Geosciences (IBG), Jülich, Germany Waste not, want not
14:30-14:45	M. Centemero, <u>Alberto Confalonieri</u>, A. Pigoli, J. Campagnol The state of the art of Italian organic fertilizers production coming from biowaste management
14:45-15:00	Mariano Alessio Verni HS and NOM under the EU Regulations on fertilisers and organic farming use: how to comply and place the product on the market
15:00-15:15	Keke Xiao, H. Horn, G. Abbt-Braun "Humic substances" measurement in sludge dissolved organic matter: a critical assessment of current methods
15:15-15:30	Enrico Buscaroli, S. Blasioli, G. Di Biase, I. Braschi Ammonia recovery from animal dejections by biochar: a circular economy proof of concept for agriculture applications
15:30-16:00	Coffee break
16:00-16:15	Andrea Ciurli, C. Franceschi, G. Di Biase, C. Ciavatta, L. Cavani Fertilizing potential of dried anaerobic digestate from slaughterhouse by-products
16:15-16:30	Elia Pagliarini, F. Gaggìa, C. Franceschi, M. Rossin, D. Di Gioia Microbial and chemical characterization of stable poultry manure and its effect on plant growth and productivity
16:30-16:45	Beatrice Giannetta, G. Galluzzi, C. Zaccone Influence of digestate application on rice yield and soil organic matter pools in a climate change scenario
16:45-17:00	D. Del Buono, J. Di Mario, A.M. Gambelli, <u>Ciro Tolisano</u> , D. Priolo, D. Puglia, A. Ranucci, G. Gigliotti

A smart and sustainable biorefinery approach to obtain nanostructured biopolymeric biostimulants, innovative fertilizers and bioenergy from olive oil waste

- 17:00-17:15 Maris Klavins, L.Arbidans, L.Ansone-Bertina, M.Mezulis, O. Purmalis Artificial humic substances from biomass waste for applications in environmental technologies and agriculture
- 17:15-18:00 Poster Session (V-VI-VII)
- 19:15 Departure: gala dinner (Repubblica di San Marino)

PROGRAMME · Friday, 30 August

9:00-12:15 Session VII: Frontiers in NOM and HS research

9:00-9:30	Invited speaker
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Yiannis Deligiannakis *Department of Physics, University of Ioannina, Ioannina, Greece* NOM carbon as co-catalyst in green-energy nanotechnology

9:30-9:45 **Alessandro Piccolo** The soil humeome and the significance of humification

- 9:45-10:00 **Patrick G. Hatcher**, J.V. dos Santos, A.I. Goranov Assessing the role of abiotic chemistry during humification in soils
- 10:00-10:15 <u>Alexander Volikov, S. Filonenko, M. Antonietti</u>
 From biomass to soil carbon: exploring the fate of artificial humic substances in Winogradsky column
- 10:15-10:30L.E. Liem, Tannis SerbenISO 19822 evaluation on hydrophobic fulvic acids analysis
- 10:30-11:00 **Coffee break**
- 11:00-11:15 <u>Konstantin Stumpf</u>, C. Simon, O. Lechtenfeld Organic matter formation and stabilisation at the molecular scale - A substrate incubation stud
- 11:15-11:30 <u>Yuki Nakaya</u>, T. Hirose, R. Tamori, N. Fujitake, S. Nakashima, H. Satoh Excitation-emission matrix (EEM) spectroscopy of humic substances in solid, solution, and complex states

11:30-11:45 Mir Seyedbagheri

On farm and laboratory evaluation on the physical, chemical, and biostimulant influence of soluble humin, humic, and fulvic (HHF solution) on soil health, fertilizer, and water-use efficiency

- 11:45-12:00 <u>Álvaro Rubio Bezares</u>, M. Olaetxea, M. Fuentes, J. Erro, A.M. Zamarreño, J.M. García-Mina
 Mechanism of action of biostimulant substances. Study with inhibitors and mutants in *Arabidopsis thaliana* L.
- 12:00-12:15 M. Santos, J. Gralian, A. James, H. Monda, R.T. Lamar, <u>Daniel Zandonadi</u> Integration of humic acid-induced transcripts changes and root growth enhancement: implications for nutrient sensing and hormonal signaling
- 12:15-13:00 Poster Session (V-VI-VII)
- 13:00-13:15 Closing ceremony
- 13:15-14:00 Light Lunch

Session I: NOM and HS for a sustainable and resilient agriculture

PI.1 <u>Said Baroud</u>, S. Tahrouch, A. Hatimi

Effect of brown algae as biofertilizer materials on pepper (Capsicum annuum) growth, yield, and fruit quality

PI.2 <u>Giacomo Chiarelli</u>, D. Sangiorgio, C. Pastore, I. Filippetti, E. Baldi, M. Toselli Effect of amendment supply on grapevine nutrient uptake and root growth: a rhizobox approach

PI.3 Joana Cupi, M. Mazzon, P. Gioacchini, D. Montecchio, C. Ciavatta, C. Marzadori Fate of sequestered soil organic carbon in a long-term field experiment shifting from perennial to annual crops

PI.4 <u>Francesco De Mastro</u>, A. Traversa, C. Cocozza, M. Spagnuolo, G. Brunetti Influence of soil management on stabilization of organic carbon

PI.5 <u>Angelica De Ros</u>, A. Cardinali, O. Francioso, V. Zuffi, M. Cabrera, L. Sartori, A. Berti, F. Morari

Determination of water-extractable organic carbon content combining high temperature catalytic combustion and VNIR spectroscopy

PI.6 B. Khiari, A. Saidani, S. Rahma Jaziri, R. Zarrouk, <u>Naceur Djébali</u> A new organic biofertilizer improves potato growth and production and soil properties

PI.7 Agnieszka Grabusiewicz

Humin isolated in DMSO/H2SO4 from the Long-Term Broadbalk experiment

PI.8 <u>Satang Hussanun</u>, P. Samran, P. Sritontip, C. Sritontip Advantage of humic acid condition on morphological changes and yield in melon

PI.9 E. Slaninova, V. Enev, L. Kubikova, J. Porizka, P. Sedlacek, D.Sirucek, <u>Michal Kalina</u> The effects of biochar application on the physicochemical and (micro)biological characteristics of soil and growth of *Zea mays* **in a model pot-cultivation experiment**

PI.10 Gyu-Min Kim, W-J. Jung, H. Jin, H-S. Shin

Exploration of indicators for compost maturity dynamics using resin fractionation of dissolved organic matter and fluorescence spectroscopy

PI.11 Jaturong Kongwutthivech

Increasing cation exchange capacity (CEC) in acidic soil with chelating properties of humic acid from Mae Moh leonardite for sustainable agriculture

PI.12 Andrii Melnyk, P. Jia, T. Melnyk, S. Butenko

Increasing stress tolerance of mustard when using growth regulators under modern climate changes in the conditions of the Forest-Steppe of Ukraine

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Assessing the coating combination of potassium chloride with commercial sub-bituminous coal extracted humic substances on maize plant growth

PI.14 D.M. Gorbunov, A.N. Khreptugova, D.S. Volkov, D.A. Arutyunyan, Irina V. Perminova

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PI.16 Mohammad Rahbari, J. Psutka, B. Black, A. Ajayi

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PI.19 Reza Shahryari Increasing of environmental drought stress tolerance by use of potassium humate in bread wheat

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PI.23 M. Morshedizad, P. Leinweber, Jerzy Weber, A.S. Gregory, Y. Kuzyakov Soil organic matter stability in the after 180-year long Broadbalk fertilization experiment as evaluated by δ^{13} C and δ^{15} N

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PI.25 <u>Daniel Zandonadi</u>, M. Santos, J. Gralian, A. James, H. Monda, R.T. Lamar Shoot to root signaling: foliar spray of humic acids enhances root growth via concerted H⁺-ATPase and NADH Oxidase activation

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PVII.18 <u>Anastasiia M. Zhirkova</u>, K.A. Bratishko, D.A. Pankratov, D.S. Volkov, M.V. Zykova, I.V. Perminova

The synthesis of ⁵⁷Fe labelled ferric hydroxide stabilized with humic substances and its use for *in vivo* studies on iron deficient rats

Humics-aminosiloxane polyelectrolyte complexes for anti-erosion treatment of hematitecontaminated grounds

<u>Mikhail Makarov</u>, K.A. Ushakova, G.S. Pechnikova, K.S. Larionov, I.V. Perminova Department of Chemistry, Lomonosov Moscow State University, Moscow, Russia

During hydrometallurgy oxidative processing of non-ferrous metal ores, a red by-product is formed composed mostly of hematite, which is a ferric oxide - a natural red pigment. In contrast to natural mineral, the red tailings contain hematite in ultradisperse state (<10 um), which makes it mobile upon release into the environments. Same color and contamination type has acid mine drainage. To prevent a spread of pollution with hematite and neutralize its reddish color, we proposed to use natural black color pigment - humic substances (HS), which mask hematite color in soils, as their mineral-adhesive compositions with aminoorganosiloxanes (AOS).

The goal of this work was to develop humics-based compositions capable of reducing migration of hematite in the environment and neutralise its red color. We used interpolyelectrolyte complexes (IPEC) based on coal humate and four different AOS. Previously, we have shown that IPEC of HS and 3-aminopropylethoxysilane (APTES) could restore soil structure by enhancing formation of waterproof soil aggregates [1]. The HS-AOS complexes of different stoichiometry were prepared by adding AOS into the concentrated solution of sodium humate (20% mass). The red tailings contaminated with hematite contained 36% Fe and had a moisture content of 29%. The HS-AOS compositions were applied onto the surface of tailings and thoroughly mixed. Screening of their efficiency was conducted with a use of express test on water stability of the produced aggregate. The best composition was HS-APTES. It was tested also with a use of wet sieving technique. Application of HS-APTES to the red tailings showed an increase in water-resistant aggregates with a diameter >0.2 mm from 13 to 35%. With an increase in the APTES:HS ratio in the complex, the proportion of aggregates <0.2 mm decreased, reaching a minimum at a ratio of 1.5:1; a further increase in the APTES dose did not lead to significant improvements in soil characteristics. An increase in the average size of tailing aggregates indicated the binding effect of IPEC on hematite and clay particles, which reduced its mobility and prevents the spread of pollution. In addition, the treated tailings got dark brown color.

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