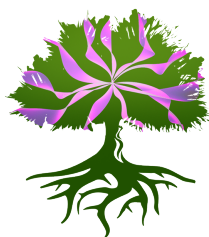


BOOK OF ABSTRACTS I TRAINING SCHOOL

“Plasma applications for smart and sustainable agriculture” – PIAgri

17 – 19th March of 2021



CA19110

Plasma applications
for smart and
sustainable agriculture



This publication is based upon work from COST Action “Plasma applications for smart and sustainable agriculture” – PIAgri, supported by COST (European Cooperation in Science and Technology).

<https://cost.eu>



COST is supported by the Horizon 2020
Framework Programme of the European Union

Contents

About	4
First Training School	4
Dates and Location	4
Local Organizing Committee	4
List of Abstracts – Talks	5
Wednesday 17th March of 2021	5
Why Non-equilibrium (Plasmas)?	5
Reactive Oxygen and Nitrogen Species: From Plasma Generation to Biological Function	6
Chemistry in plasma treated liquids and methods of characterization	7
Plasma treatment of plants: puzzle games for biologists and physicists	8
Thursday 18th March of 2021	9
Plasma sources for treatment of liquids	9
Mass spectroscopy diagnostics of sources and reactive species in atmospheric plasmas	10
Upscaling of plasma sources for food processing applications	11
How to Write a Good Journal Paper (or Thesis)	12
The role of chemically or physically induced redox processes in wastewater treatment	13
How to study the degradation process of organic contaminants in plasma systems for	
water treatment	14
Plasma sources for the treatment of seeds and plants	15
Soil – bio aspect	16
Basics of Optical Diagnostics of Atomic and Molecular Species in Plasmas	17
Friday 19th March of 2021	18
Plant response to stress induced by seed treatment with plasma: the biochemical context	18
Connecting the dots: from plasma physics to plant biology	19
Imaging and electrical diagnostics of non - equilibrium plasmas at atmospheric pressure	20
Characterization of plasma treated food products: quality, safety and assessment	
techniques	21
Cost Action PIAgri	22

About

The 1st PIAgri Training School was aimed primarily towards young researchers (PhD students, young post-docs), as well as, researchers interested in obtaining the knowledge from different fields and also representatives from industry. The course was focused on integrating fundamental knowledge in this multidisciplinary field and understanding specific aspects of different requirements and expertise in topics such as:

- Plasma physics in general;**
- Plasma-water interactions and chemistry;**
- Plasma sources;**
- Plasma diagnostics;**
- Waste water treatment;**
- Plasma treatment of seeds and plants;**
- Plasma sources for food processing: design, characterization and upscaling.**

The 1st PIAgri Training School highlighted the most recent developments in each topic, promoting a strong interaction between experienced trainers working on different topics and trainees.

First Training School

The main focus of the school was on the state-of-the-art in the field of plasma agriculture. The trainees will have the opportunity to be acquainted with the latest accomplishments which will be presented in such level that trainees from different fields (sciences) can obtain a basic knowledge.

Dates and Location

Due to the situation with COVID -19 and travel restrictions, the First Training School has been organized as a hybrid event from 17-19th March 2021 in Hotel Termag, Jahorina, Bosnia and Herzegovina and under the local organization of the University of East Sarajevo (UES) and the Faculty of Technology Zvornik.

Local Organizing Committee

Prof Dragan Vujadinovic Prof Milan Vukic Ms Jelena Vulinovic

Connecting the dots: from plasma physics to plant biology

Milica Milutinovic

Institute for biological research "Siniša Stanković" – National Institute of the Republic of Serbia, University of Belgrade, Bulevar despota Stefana 142, 11060 Belgrade, Serbia

Seed germination and early seedling growth are the most sensitive growth stages for plants, especially crops, to a wide range of environmental stressors. Many efforts have been made to enhance seed germination and seedling vigor by applying various methods. As an alternative to chemical treatments, plasma technology could be one of the emerging technologies to enhance seed germination. "Plasma Agriculture" potentially offers increased production with less impact on ecosystem, giving rise to various beneficial effects such as inactivation of seed/plant-borne pathogens, enhancement and increased crop yields, and maintained good food quality. This presentation will attempt to review the effect of non-thermal plasma (NTP) and plasma activated water (PAW) on seeds and emphasis will be given to the change in the physical and biochemical properties of seeds. In treatments where seeds are in direct contact with plasma or afterglow, the surface of seeds undergoes a variety of changes. During the plasma treatment, depending on the plasma conditions, the surface is activated so other functional groups can be attached ($-COOH$, $-COH$, $-COO$, $-NH_2$, $-OH$, $-NO$, etc.) leading to the changes on seeds' surface. Similarly, PAW contains large amounts of chemically active species produced in plasma and at the plasma-liquid interface which can be transferred from the interface volume to the liquid bulk and are able to trigger desired responses in biological samples i.e. increase of germination percentage, decontamination of both seeds and plants and faster growth. Further, we will discuss the change in biochemical analysis, e.g., the variation in phytochemicals and antioxidant levels of seeds after plasma treatment with the aim to clarify the key mechanisms underlying plasma-agricultural applications in order to better understand, control, and scale up these new processes.

Key words: non-thermal plasma, PAW, seed, seed germination.