

## Report on the outcomes of a Virtual Mobility<sup>1</sup>

**Action number:** CA19110

**Grantee name:** Ignacio Muro Fraguas

### **Virtual Mobility Details**

Title: How important seed treatments by Cold Plasma is for PIAgri Members? Evaluation of plasma sources, protocols and challenges

Start and end date: 01/10/2023 to 20/10/2023

### **Description of the work carried out during the VM**

Description of the virtual collaboration and activities carried out during the VM, with focus on the work carried out by the grantee. Any deviations from the initial working plan shall also be described in this section.

*(max. 500 words)*

The main objective of this Virtual Mobility was to generate a report and an instructional video related to the application of plasma treatments of seeds, focusing on common points among the different research groups, trying to understand the link among plasma sources, plasma setup parameters and the objectives achieved; how the different seed storage conditions before and after plasma treatments affect the final results, the main difficulties encountered and possible future collaborations.

For that, an online survey was sent to the members of the Working Group 2 “low-temperature plasma treatment of seeds” of the CA19110 and to the experts in the field who published an article related to plasma for seeds in the last 5 years. The published articles were searched using Google Scholar by selecting the following research criteria as input:

- Plasma AND Seeds.
- Seed AND (Decontamination OR Germination) AND Plasma.

Specifically, the contents of the report are the following:

- Brief introduction about the survey sent, participation rates, information on the research groups that have participated and gender balance.

<sup>1</sup> This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

- Survey results related to the plasma equipment used, working pressure, optimal parameter configuration based on the desired objective and possibility of industrial scalability.
- Survey results related to the objectives pursued.
- Survey results related to the types of seeds analysed.
- Survey results related to seed storage conditions before and after plasma treatment.
- Survey results related to the main difficulties encountered.
- Survey results related to external needs and future collaborations.

Furthermore, the literature has been analysed to integrate and properly interpret the results obtained from the survey. Besides, the bibliography has been consulted to provide to the Community useful information regarding aspects such as:

- Plasma sources, working pressure and optimal parameters configuration to establish a good balance between seed germination and decontamination.
- Understanding of the mechanisms and the modifications caused by plasma treatments in seeds.
- Storage conditions that should be taken into account and declared.

On the other hand, the video tries to sum up the survey results described in the report. Besides, it is described the plasma equipment's available in my research group and how we applied plasma of seeds. I considered that this final part of the video could be very useful for the rest of the groups since we have the most common type of plasma source among the rest of the centres (DBD at atmospheric pressure) and we have experience in tomato seeds (the 3<sup>rd</sup> seed most used for the community).

### **Description of the VM main achievements and planned follow-up activities**

Description and assessment of whether the VM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the VM. Agreed plans for future follow-up collaborations shall also be described in this section.

*(max. 500 words)*

It is considered that the pursued objectives have been achieved.

The work carried out in 2021 by Dr. Nina Recek, who coordinated the round table "Green plasma for a green future", has continued. In my current work, information is shared from a community of groups experienced in seed treatment with plasma. Specifically: plasma setup parameters applied for each research group (power, voltage, plasma gas, gas flow, working distance and treatment time), types of seeds treated by plasma for the community, protocols for storing and preparation of seeds before the plasma treatment, main difficulties found, external needs of each research group and ideas for industrial scalability.

For the future it would be interesting to increase the participation rate and thus obtain more information that can guide the plasma seed community. In the present work, 26 research groups from 20 different countries, that are currently applying plasma treatments on seeds have participated in the study. Besides, it could be interesting to unify criteria in the seeds storage conditions to corroborate their effects on seed germination and decontamination. Finally, given that the needs of each of the groups were shown, it should be possible for other expert groups in these fields to get in touch to improve their research.

To sum up, the following MoU objectives were achieved:

- Analysis of the existing problems associated with seeds (germination percentage, rate, uniformity, and decontamination) → By asking to the plasma groups the objectives they are seeking.

- Identification and optimization of the most promising plasma source for treatment of seeds → By asking to the plasma groups questions related to plasma equipment available and plasma parameters configuration.
- Contribution to the definition of possible solutions assisted by cold plasma → By consulting the existing literature published in the last 5 years related to the application of plasma treatment of seeds.
- Definition of procedures and protocols for specific optimized cold plasma technologies used in treatments of seeds → By asking to the plasma groups questions related to seeds storage conditions before and after plasma treatment.