

Plasma applications for smart and sustainable agriculture-possibilities and challenges

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The population growth represents a serious challenge for humankind due to the continuous increase in demand for food. The climate change is also presenting a significant factor on food production due to the change in weather patterns, pest appearance, water availability etc. Therefore it is necessary to develop new and efficient technologies that can enhance productivity while maintaining food quality and safety. One of these technologies are non-equilibrium (non-thermal plasmas) plasmas that are considered as a green alternative to conventional fertilizers in agriculture to improve yields, increase size and robustness of plants, to reduce (or eliminate) the need for pesticides and in the case of final products treatments of food and its packaging. The reason for this is their rich plasma chemistry that is created in gas phase (at room temperature) and can be easily transferred to liquid samples. Plasma chemistry is rich in Reactive Oxygen Nitrogen Species (RONS) [1] and it was shown that low pressure and atmospheric pressure plasmas can be successfully used in stimulation of the seed growth, increase of germination percentage and decontamination, breaking of dormancy or lengthening of the seed sprout [2, 3]. In direct plasma treatments (gas phase plasma is in contact with sample surface) of seeds the surface is activated and different functional groups can be attached resulting in increased wettability, coating with desired compounds or just decontaminated from pathogens [4]. Another successful approach is in treatment of water for production of Plasma Activated Water (PAW) rich in long living RONS [5]. Here we will present some of the recent results in the field of Plasma Agriculture and address future challenges of plasma applications in this field.

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