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Abstract

Exploring the Effects of Cold Plasma on Wheat Seed Surface, Germination and Growth †

Pia Starič [1,*], Ita Junkar [1], Katarina Vogel Mikuš [1,2] and Miran Mozetič [1]

[1] Jožef Stefan Institute, 1000 Ljubljana, Slovenia; ita.junkar@ijs.si (I.J.); Katarina.VogelMikus@bf.uni-lj.si (K.V.M.); miran.mozetic@ijs.si (M.M.)
[2] Biotechnical Faculty, University of Ljubljana, 1000 Ljubljana, Slovenia
* Correspondence: pia.staric@gmail.com
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Abstract: Seeds have large economic importance all over the world. They are an essential source of minerals, proteins, starch, and oil reserves in the early stages of plant development and growth. A high abundance of such molecules makes seeds of cereals and legumes a major food source for the majority of the human world population. However, to gain optimal yield of important crops and to avoid pests, many farmers use pesticides and agrochemicals before, during, and/or after harvesting of crops. A wide and common use of such chemicals can cause pest resistance and harmful effects on soil and the surrounding environment, which represents a global threat to the environment. The non-thermal or "cold" plasma technology is becoming more and more popular in the field of agriculture. It has been successfully used by scientists for the treatment of various types of seeds under specific conditions. Plasma treatment has, in some cases, triggered specific responses in plant seed growth and development, which could be used to agricultural advantage. Many researchers have reported changes in hydrophilic properties of seed surface and increased water uptake. Moreover, plasma-treated seeds showed improved growth, increased yield and triggered possible plant resistance to abiotic stress such as drought and salinity. The objective of our experiment is to identify surface changes after cold plasma treatment, and the influence of plasma treatment on seed development and early growth. Different direct and indirect plasma treatments were applied on seeds of two winter wheat varieties. We examined and detected changes in the chemical composition of seed coat and changes in hydrophilic properties of seed surface. Plasma treatment also affected the dynamics of water uptake of seeds, germination rate and the root number of plants.

Keywords: cold plasma; seeds; wheat; surface modifications; XPS; water contact angle; germination; root

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