

Bio-Polymers in the World of Plasma: Effects of Cold Plasma on Seed Surface [†]

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Seeds can be considered as natural biopolymers. They are an essential source of nutrients for agriculture and food production. However, to gain optimal yield of important crops, many use pesticides and agrochemicals before, during, and/or after the harvesting of crops. This represents a global threat to the environment, as its wide and common use can cause the resistance of pests to these chemicals and harmful effects on the soil and the surrounding environment.

Non-thermal or “cold” plasma has been successfully used for the treatment of various types of polymers and has recently also shown great potential in the field of agriculture. Many researchers have reported changes in hydrophilic properties of seed surfaces, increased water uptake and altered surface morphology, which was correlated with selective etching of the biopolymer matrix. Moreover, the plasma treated seeds showed improved growth and possible resistance to abiotic stressors such as drought and salinity.

The objective of our experiment was to identify surface changes after cold plasma treatment, and the influence of changed seed morphology and chemistry. Different plasma treatments were applied on seeds of two winter wheat varieties. We examined and detected changes in the chemical composition of the seed coat with X-ray photoelectron spectroscopy (XPS) and changes in the hydrophilic properties of the seed surface. Plasma treatment also affected the dynamics of the water uptake of seeds. The XPS analysis detected chemical changes on the seed surface, depending on the mode of plasma exposure: either direct (glow) or indirect (afterglow) and time-dependent plasma exposure.

Supplementary Materials: The following are available online at <https://www.mdpi.com/2504-3900/69/1/23/s1>.

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