

**Plasma application to plant health**

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We have applied atmospheric pressure non-thermal plasma to control pathogenic contamination and enhance germination and growth for improving plant health. In a case study, it is found that arc discharge plasma and the combined treatment of ozone and ultrasonic wave are effective in sterilizing rice seeds infected with *Fusarium fujikuroi*, causing rice bakanae disease. Fungal spores were detached from seed surface and seed surface became more hydrophilic by treatment with arc discharge plasma. Shockwave generated by arc discharge plasma seems to have played an important role in spore detachment. Hydrophilic seed surface may facilitate entering of water containing ROS and RNS inside seeds. Another case study demonstrates that water and 0.5 mM phosphate buffer treated with plasma generated gas nitric oxide gas can enhance growth and tolerance to water deficiency of spinach seedlings. There was an optimum dilution of treated solutions that showed the greatest efficiency. We also observed anti-microbial activity of the solutions with similar dilution. Our studies suggest that plasma can produce both inactivation and activation effects depending on organisms in a system. These works were supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIP), (No. 2010-0027963, 2016R1D1A1B03934922), Rural Development Administration (RDA) grant (No. PJ009891) and National Fusion Research Institute (NFRI).