Non-thermal dielectric barrier discharge plasma technology for agriculture food

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Non-thermal dielectric barrier discharge (DBD) plasma is an innovative and emerging field combining plasma physics, life science and clinical medicine. Plasma techniques are applied in treating surfaces, materials or devices to realize specific qualities for subsequent special medical applications, plant seeds to improve the production and quality of crops, and living cells or tissues to realize therapeutic effects. Our several studies summarized that non-thermal DBD plasma has potential biological applications in soybean sprout growth and chicken embryonic development. Upon investigation, plasma treatment at 22.1 kV for 12 s maximized the germination and seedling growth of soybean by increasing the concentrations of soluble protein and antioxidant enzymes and regulating the gene expression of adenosine triphosphate levels, target of rapamycin, and growth-regulating factor. In addition, exposing the developing chicken embryos at either Hamburger-Hamilton (HH) stage 04 or HH 20 to plasma at voltages of 11.7 kV to 27.6 kV for 4 min resulted in dose-dependent embryonic death and HH 20 stage embryos survived longer than those at stage HH 04, while exposure at 11.7 kV for 1 min promoted chicken embryonic development. These facts suggest that intensity and exposure time of non-thermal DBD plasma should be sufficiently optimized for the growth-promoting effects in soybean sprouts and chicken fertilized eggs before hatching. The current developments in this field may be beneficial to improve the plant productivity and the livestock industry for agriculture food.

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