10th Central European Symposium on Plasma Chemistry
21st International Conference on Plasma Physics and Applications

Bucharest, Romania, 1-5 September 2025

Book of Abstracts

Edited by: Daniela Dobrin, Monica Magureanu, Bogdana Mitu, Veronica Satulu

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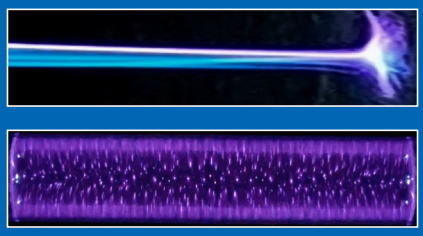

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Comparison of three plasma-activated water systems on the growth and germination of *Lactuca sativa* L. plants

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The increasing global population underscores the urgent need for sustainable food production. Contemporary agricultural practices depend heavily on commercial fertilizers, with nitrogen serving as an essential nutrient for plant growth [1]. Cold plasma generates reactive oxygen and nitrogen species (RONS), which dissolve in water to form plasma-activated water (PAW). PAW has shown considerable potential in agricultural applications, as the prolonged bioavailability of RONS may act as signaling molecules in plant metabolism or contribute to nutrient supply [2]. This study investigates the effects of PAW produced by three different non-thermal plasma systems—transient spark (TS), fountain dielectric barrier discharge (FDBD), and microwave plasma (MWP)—on the growth and development of lettuce (*Lactuca sativa* L.) plants and seeds. Plants were grown in the soil and irrigated with PAWs for five weeks. The amount of applied PAW increased with the developmental stage of the plants. The impact of PAW was evaluated by assessing germination rate, shoot and root length, fresh and dry biomass, number of leaves, and photosynthetic pigment concentration one month after sowing. In addition, germination performance was analyzed using a germination paper test over eight days, including measurements of germination percentage, mean germination rate, seed vigor index, and fitting of the Richards function. The results indicate that each PAW exerts distinct effects on physiological parameters, largely depending on its specific chemical composition. Overall, PAW treatments significantly enhanced biomass accumulation, reflected in increased leaf number and length, as well as higher fresh and dry weight. Although no notable improvement in germination rate was observed, all PAW treatments positively influenced seed vigor, highlighting their potential in improving early seedling performance.

Keywords: dielectric barrier discharge, *Lactuca sativa*, physiological parameters, plasma-activated water, transient spark.
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