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3P14 - Argon cold atmospheric pressure plasma jet enhancing seed germination and seedlings growth of fenugreek (Trigonella foenum-graecum)

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Abstract
Atmospheric pressure cold plasma jet gained a great interest overall the world due to its wide band of application in medicine, industry and agriculture [Puač et al., 2018]. Therefore, in this work we investigated the impact of cold atmospheric pressure argon plasma jet on the germination and early seedling growth of fenugreek (Trigonella foenum-graecum L.). The plasma jet system is a two-electrode with and without additional grounded electrode which is called "accelerated electrode"(AE), and used with different exposure times: 0, 30-sec, 1-min, 10-min, 15-min and 20-min. The results showed that plasma jet had a significant effect on seed germination with 40%, 33%, 14%, 57% and 33% at 30-sec, 1-min, 5-min, 15-min and 20-min, respectively. The effect of plasma jet was not significant on root length, but in contrast to that the length of plumule significantly affected. The fresh weight of shoot significantly increased, and in particular at 10-min exposure time. The 1-min exposure time resulted in an increase of root and shoot dry weight, but the 15-min ground exposure time lead to a decrease of root and shoot dry weight. The root:shoot ratio of seedlings treated with plasma was lower compared to the control plants. The findings of this study suggested that cold plasma could stimulate the germination, taking in consideration that cold plasma is an economic and pollution-free method in plant productivity improvement. The results found that O-radicals emission spectrum was enhanced 5 times, because of the AE presence that enhance the electric field, and forming more streams. The effect of the three parameters; O-radicals, enhancement of the electric field and streamers, might be the cause of seed germination improvement by the plasma jet.
References
Puač N, Gherardi M, Shiratani M. Plasma agriculture: A rapidly emerging field. Plasma Process Polymers. 2018;15:e1700174. https://doi.org/10.1002/ppap.201700174

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