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(G*) Electrifying Greenhouse Agriculture: Cold Atmospheric Pressure Plasma Technology for Pythium ultimum Control

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Hydroponic growth of food plants in greenhouses plays a key role to assure future autonomy of food supply, especially in harsher climate zones like Canada. Unfortunately, however, greenhouse culture yields are drastically reduced by the proliferation of pathogenic microorganisms due to its humid environment. In Canada, the fungus Pythium ultimum has a particularly large impact on food production, by causing root rot. Chlorination and ozone have failed to combat Pythium spp. We thus envision water treatment with non-thermal air plasma. It is an efficient source of chemically highly reactive oxygen and nitrogen species that are responsible for the anti-microbial activity of plasma. As an additional benefit to the pathogen inactivating properties of plasma treated water, the plasma generated reactive nitrogen species constitute a chemical approach to fixate nitrogen, providing one of the essential plant nutrients.
A chemical study of the reactive species is liquid phase will be presented, before comparing the efficiency of Pythium Ultimum deactivation in liquid phase following different plasma treatments. This efficiency will first be analysed with the use of inoculated distilled water ELISA assays, followed by a hyphal mass growth comparison in dextrose broth medium over the period of 1 week post treatment. Further proof of pythium inactivation is investigated with SEM imaging and the plausible chemical pathways for inactivation are discussed.

Keyword-1

Agro-chemistry

Keyword-2

Pathogen inactivation

Keyword-3

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