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(G*) Plasma activated water treatment in hydroponic culture: from seedling to mature growth

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Rupture of the supply chain caused by the COVID-19 pandemic highlighted the need for increased local food production. Coupled with population increase, there is steadily increasing demand for fresh local produce. While hydroponic growth allows year-long environmentally controlled production, its humid environment brings undesirable side effects like the proliferation of fungi. For example, Pythium and Phytophtora fungi lower the yield of Boston lettuce production; to combat these pathogens we envisage water treatment with non-thermal air plasma, a method where chlorination and ozone have failed. This enables other beneficial reactions, nitrogen fixation, which help reduce the need for commercial fertilizers.

Before tackling the larger-scale use of plasma in Quebec-based green houses, our team is first conducting the following laboratory-scale investigation. We study the evolution of lactua savita var. capitata in a batch type hydroponics system, from seedling to a fully mature growth. A comparison is conducted between plasma treated and untreated contaminated water, with or without added nutrient, and positive (tap water + nutrients) and negative controls (tap water only), to assess the impact of plasma treatment on plant growth and possible phytotoxicity. Plant growth indicators such as root length and foliage size are investigated; evolution of the water and its nutrient content are monitored with pH, conductivity and colorimetric essays for both NO_2ˆ- and H_2 O_2 with Griess reagent and titanium sulfate stabilized with sodium azide. Electrical parameters for plasma generation are correlated to those resulting chemical moieties in the water.

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