Efficacy of electrolytic disinfection of nutrient solution to hamper dispersal of plant viruses in irrigation water

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ABSTRACT

Several sources of water can be used for irrigating crops. Some of them pose a high risk to disseminate plant pathogens. For instance, tailwater collected by channels and directed to ponds or tanks to be reused for irrigation poses a high risk for dissemination of plant pathogens. Thereby pathogens such as zoosporic organisms, fungi, bacteria and viruses are introduced directly from crops in cultivated fields, greenhouses or natural vegetation surrounding the fields. Among these pathogens, plant viruses are of particular interest because they can´t be cured. Therefore, effective sanitation methods are required to minimise the dispersal of plant pathogens. Currently, the grower has the choice between different physical or chemical water treatments. Beside cost effectiveness and ecological concerns none is suitable to inactivate the multitude of relevant plant pathogens, in particular viruses.

We determined and evaluated the potential of a new sensor-based disinfection procedure to inactivate fungal, bacterial or viral plant pathogens in hydroponic systems in greenhouse production.

The efficacy of a low concentrated Potassium hypochlorite produced on-site by an electrolytic disinfector to inactivate plant pathogens was first tested *in vitro* according to the standard (OEPP/EPPO, 2008). Subsequently trials under practical conditions were initiated focusing on the potential of the disinfection procedure to prevent the spread of economic important plant by recirculating nutrient solution in tomato.

Dose-effect relations were calculated for different plant pathogens. As expected, contact time and dose required to eradicate pathogens varies with pathogen species and life stage. The disinfectant injected once weekly into the nutrient solution at 0.2 or 0.5 mg free chlorine/l nutrient solution for 60 or 30 minutes by a sensor, prevented the dispersal of *Pepino mosaic virus* in tomato crops (Bandte et al., 2016). These injection intervals assured that virus particles and even fungal spores of economic important pathogens released from infected plants do not accumulate and form an infectious reservoir. The yield of tomato plants grown in KCIO-treated nutrient solution was even significantly higher than that of control plants.

References

Bandte M, Rodriguez MH, Schuch I, Schmidt U, Buettner C. **2016.** *Irrigation Science* **34**(3): 221-229.
OEPP/EPPO, 2008. *EPPO Bulletin* **38**, 311-315.