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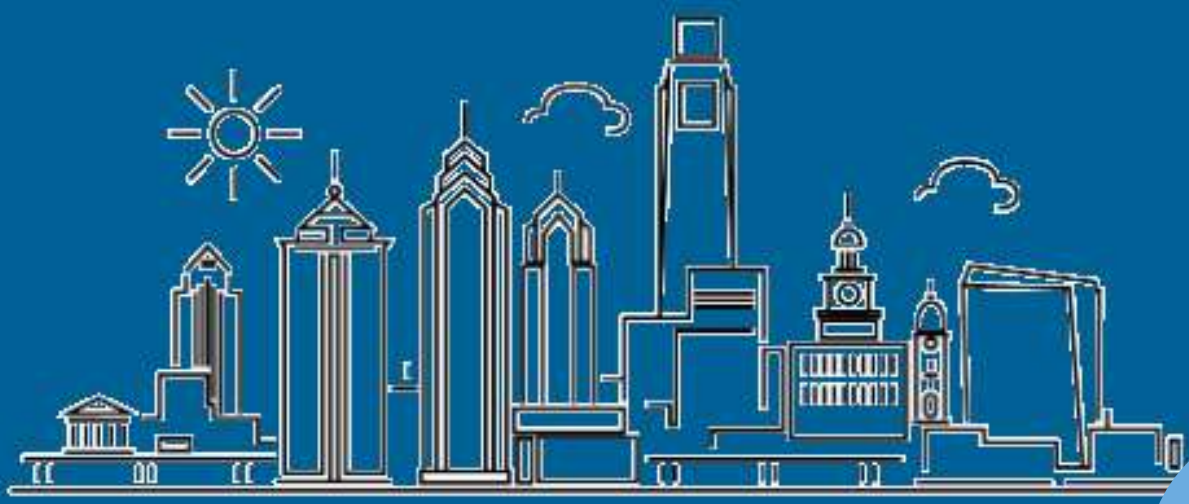

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Use of the plasma activated water as plant defense enhancer

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Bacteria and phytoplasmas (insect-transmitted cell wall lacking bacteria), are involved in severe diseases affecting agronomic relevant crops. Management of the diseases due to these agents has mainly focused on the use of copper compound or antibiotics for bacteria, on insect vector chemical control and infected plant rouging for phytoplasmas, but all of these methods presents some drawbacks. Indeed, many efforts are devoted to find effective and environmental friendly control strategies. The use of plasma activated water (PAW), produced by a nanosecond pulsed dielectric barrier discharge, as innovative and alternative possible management tool to control plant diseases due to bacteria and phytoplasmas was experimentally exploited. The exposure of sterile distilled water (SDW) to a non-equilibrium atmospheric pressure plasma induces a reduction of pH and the production of reactive oxygen and nitrogen species (RONS), such as hydrogen peroxide, nitrates and nitrites [1] that might induce plant defense responses, involving both hypersensitive reaction and systemic acquired resistance. The effects of PAW applications were tested on three different pathosystems: tomato plants experimentally inoculated with *Xanthomonas vesicatoria* (Xv), phytoplasma infected periwinkle micropropagated shoots and grapevine infected plants in vineyards. Quantitative RT-PCR analyses allowed to determine the transcription level of genes involved in the plant defense response (phenylalanine ammonia-lyase, *pal*) and in the phytoalexin metabolism of PAW treated materials. The number of leaf spots caused by Xv in tomato plants and the number of symptomatic grapevine plants in in vineyards were significantly reduced by the treatments. Moreover, the transcriptomics results highlighted the *pal* gene and the genes involved in the phytoalexin production increased expression. The PAW ability to enhance some of the plant defense mechanisms improving the health status of the treated plants was experimentally demonstrated.

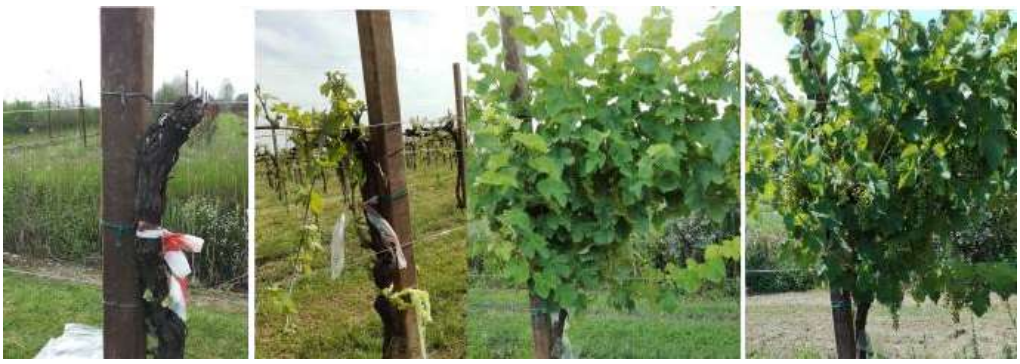

Fig. 1. Grapevine phytoplasma-infected plants treated with PAW at different times. From the left: April 2015; April 2016; June 2016 and July 2016 [2].

References

[1] R. Laurita, *et alii*, Clin. Plasma Med. 3, 61 (2015).
[2] A. Bertaccini, *et alii*, 23rd International Symposium on Plasma Chemistry, Montreal, Canada (2017).