Proceedings of the LXV SIGA Annual Congress
Piacenza, 6/9 September, 2022
ISBN: **978-88-944843-3-5**

Poster Communication Abstract – 5.41

PULSE THERMOGRAPHY AS A NEW TOOL FOR EARLY DETECTION OF NECROTROPHIC FUNGAL INFECTIONS IN PLANTS

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pulse thermography, Botrytis cinerea, plant-pathogen interactions, early disease detection

Botrytis cinerea is a "high-risk" pathogen characterized by short life cycle, high reproduction, and genetic variation, which are the cause of rapid selection of strains resistant to the common applied fungicides. Infrared thermal imaging, widely applied in different fields, is a non-destructive and fast technique, which holds great promise also for the detection of pathogen attacks in plants.

Herein, we evaluated and predicted the development of gray mold, caused by the necrotrophic fungus *B. cinerea* in pepper (*Capsicum annum*) and tomato (*Solanum lycopersicum*) plants by pulse thermography of the leaves in the pre-symptomatic phase. Pepper and tomato plants were inoculated with different concentrations of *B. cinerea* or *Trichoderma harzianum* spores, a beneficial fungus employed as non-pathogenic control. Thermographic measurements, carried out during seven days after infection, revealed specific thermal patterns in the infected leaves after a few hours (6 – 48 h) and much more earlier than the appearance of the characteristic lesions caused by *B. cinerea*. Diagnostic parameters, such as specificity, sensitivity, positive and negative predictive thermographic values, confirmed a good reliability of the pulse thermography technique in the early detection of *B. cinerea*

infections. In order to better understand the mechanisms underlying the thermographic patterns caused by the gray mold, stomatal opening and conductance as well as expression of genes typically involved in plant-pathogen interactions were determined. Altogether, our data, supported by physiological, cellular and molecular evidence, demonstrate that pulse thermography imaging is a valid and reliable diagnostic tool for the rapid detection of *B. cinerea* infection and, possibly, to other necrotrophic fungi, to be applied for a rapid plant phenotyping of resistance/tolerance to this kind of phytopathogens as well as for a more automatized, and sustainable control of this plant disease