

# APPLICATION OF GEOSTATISTICS ON PHENOMIC AND PHENOTYPING DATA: AN A POSTERIORI DIAGNOSTIC OF DISEASE SPATIAL PATTERN UNDER NATURAL INFESTATION

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## ABSTRACT

Effective disease evaluation relies on a better understanding of specific interactions between host and pathogen. One problem related to soilborne diseases is the non-homogeneous nature of soilborne pathogens in terms of distribution and/or genetics that could lead to misinterpretations with respect to the presumed host resistance. The objective of this study was to analyze the *V.dahliae* distribution by looking at the spatial pattern of the sunflower Verticillium Wilt in a native system. A set of experiments were conducted from 2013 to 2015 in fields with sunflower Verticillium Wilt history. One symptomatic and one asymptomatic sunflower genotypes were introduced at specific locations (defined by spatial coordinates) to establish a grid arrangement for the disease spatial pattern evaluation. Two different sets of traits were recorded: i) reference methodology for Verticillium Wilt phenotyping (disease incidence and severity) to characterize regions of disease prevalence from 2013 to 2015, and ii) phenomic index (NDVI, passive method) to integrate senescence components in the disease evaluation in 2015. Geostatistical analyses were performed on both sets of traits and both controls to evaluate part of the micro-environment variability within the field that can interact with disease expression. The control scores were then interpolated to unsampled points through the Ordinary Kriging method. Results showed significant variation in the disease expression at field level. This confirmed that the pathogen components play a major role in the plant probability to develop the disease. No significant losses of biomass were observed, leading to the conclusion that the senescence factor did not interact with disease expression.

**Key Words :** Sunflower, *Verticillium dahliae*, geostatistics