MATHEMATICAL MODELLING OF WITHIN-FIELD PROPAGATION OF A DISEASE AND ITS INSECT VECTOR

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The control of plant diseases and their insect vectors requires a deep understanding of how they spread in space and time. In this context, we developed mathematical models taking into account environmental variability which may influence the spatio-temporal propagation of infection. The models describe two phases: firstly, there is only primary infections due to arrival of winged insects. Secondly, the phenological growth stage of plants are such that non-winged adults can colonize plants nearby. Tools from the theory of point processes are used. Statistical procedures are proposed for processing the data when exhaustive or systematic samplings are carried out at, at least, two dates. Bayesian and Monte Carlo approaches are discussed. We illustrate our approach with a study of data on the Yellow Leaf Sugar Cane Virus disease and its insect vector Melanaphis sacchari.