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Optimization of control strategies of plant epidemics through a simulation model validated by experiments

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Management strategies of epidemics are often based on expert opinions rather than on the formal demonstration that they are, at least in theory, effective. This mainly results from the complexity of taking into account the biological processes and the human interventions that both impact disease spread. A promising approach to overcome these obstacles consists in identifying optimized management strategy through modeling both the epidemic process and the control measures.

This approach, transposable to many epidemic diseases, is applied on sharka, the most damaging disease of stone fruit trees (especially apricot, peach and plum). It is caused by *Plum pox virus* (PPV, genus *Potyvirus*), a quarantine pathogen in the European Union. A spatiotemporal model simulating sharka spread in a heterogeneous landscape has been developed. One key hypothesis of this model is the synchrony between incubation (the time between inoculation and symptom expression) and latency (the time between inoculation and infectiousness of the host) for PPV-infected peach trees. We developed a generic approach to estimate the mismatch between incubation and latency from repeated transmission experiments. Then, sensitivity analyses are performed in order to identify key parameters of both the epidemic process and the control strategy.

Key words: infectious potential, latent period, *Potyviridae*, SEIR, stochastic spatiotemporal simulation model