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Model-based identification and optimization of key parameters for sharka management strategy

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Strategies for disease control are often based on expert opinions rather than on the formal demonstration that they are, at least in theory, effective. An alternative and promising approach consists in modeling both the epidemic processes and control measures in order to optimize disease management. In this way, the most influential parameters can be identified, and alternative control strategies can be proposed and tested *in silico* in order to assess their potential efficiency. To this end, we developed a spatially-realistic stochastic model simulating disease dynamics and management. We used this model to carry out generic sensitivity analyses with parameter ranges large enough to encompass values that are typical of many perennial plant diseases and of their management. These analyses revealed the importance of the latent period duration. Then, we specifically scrutinized the main processes affecting sharka epidemics, caused by Plum pox virus, a quarantine pathogen of prunus trees (especially apricot, peach and plum) in many areas of the world (Rimbaud et al., 2015). Using realistic parameter ranges given the present knowledge of sharka epidemiology, another sensitivity analysis on the most promising control parameters enabled the theoretical economic optimization of sharka management strategy. The identified optimized control strategies are discussed with the organizations responsible for sharka control in order to help the design of durable and cost-effective strategies.