How to reduce fungicides to manage black leaf streak disease of bananas ? A modelling approach to design innovative spatial strategies

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MODELLING APPROACH TO DESIGN INNOVATIVE SPATIAL STRATEGIES TO CONTROL BLACK LEAF STREAK DISEASE OF BANANAS

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Black leaf streak disease (BLSD), due to the airborne ascomycete *Pseudocercospora fiji*ensis, is the main constraint of banana production for exportation by damaging leaves and impacting fruit ripening and yield. In any producing country in the world cultivating very susceptible varieties, the disease is managed by frequent aerial applications of fungicides (about 50 in Costa-Rica). Due to fungicide resistance and considering environmental impacts, such frequent fungicides strategies is not durable. As experiments are difficult to implement at the scale of a production basin (e.g. several hundred hectares), modelling is a key approach to identify innovative scenarios to reduce the use of pesticides while efficiently and sustainably control the disease. In this study, we assess the efficacy of different spatiotemporal strategies to reduce pesticide use. These strategies, chosen with banana producers, are either directly based on fungicide applications (reduction of application frequency, spatial coverage or dose), or based on the deployment of resistant cultivars (increase in spatial coverage, resistance efficiency, choice of target pathogen traits). To test these strategies, we adapted a mathematical spatially-explicit model called *landsepi* (Rimbaud et al., 2018) to simulate BLSD epidemics in a real agricultural landscape. The adaptation of the *landsepi* model is undergoing and consists in modifying plant growth and epidemiological parameters. Using this model, we plan to compare the yield and epidemiological control provided by the simulated control strategies in a real 300-ha banana production basin. More than 11,000 simulations are currently running and will help identify the most promising strategies to test in the field.

Keywords: epidemiological simulation, spatial scenarios, durable control;