



Durable strategies to deploy plant resistance in agricultural landscapes

Frédéric F. Fabre, Elsa Rousseau, Ludovic L. Mailleret, Benoît Moury

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Durable strategies to deploy plant resistance in agricultural landscapes

F. Fabre^a, E. Rousseau^a, L. Mailleret^b et B. Moury^a

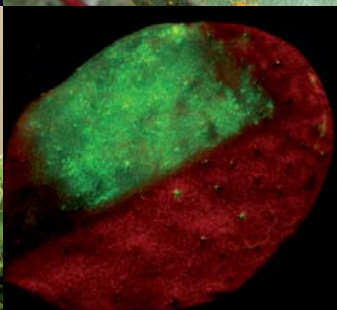
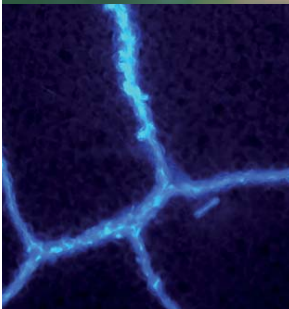
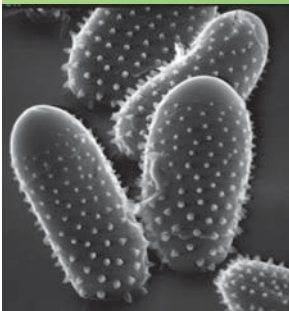
^aINRA, UR 407 Pathologie Végétale, 84000 Montfavet, France; ^bINRA, UR 880 URIH, 06903 Sophia Antipolis, France
frederic.fabre@avignon.inra.fr

The deployment of resistant crops often leads to the emergence of resistance-breaking pathogens that suppress the yield benefit provided by the resistance. Here, we theoretically explored how farmer main leverages (resistant cultivar choice, resistance deployment strategy, landscape planning, cultural practices) can be best combined to achieve resistance durability while minimising yield losses due to plant viruses. Assuming a gene-for-gene type of interaction, virus epidemics are modelled in a landscape composed of a mosaic of resistant and susceptible fields, subjected to seasonality, and of a reservoir hosting viruses year round. The model links the genetic and the epidemiological processes shaping at nested scales the demo-genetics dynamics of viruses. The choice of the resistance gene (characterized by the equilibrium frequency of the resistance-breaking virus at mutation-selection balance in a susceptible plant) is the most influential leverage of action. Our results showed that optimal strategies of resistance deployment range from mixture (where susceptible and resistant cultivars coexist) to pure strategies (with only resistant cultivar) depending on the resistance characteristics and on the epidemiological context (epidemic incidence, landscape connectivity). We demonstrate and discuss gaps concerning virus epidemiology across the agro-ecological interface that must be filled to achieve sustainable disease management.



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Livre des résumés



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