A Stage-Structured Seasonal Model for the Spread of Flavescence Dorée in Vineyards

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Abstract

Flavescence dorée is one of the most severe phytoplasma diseases affecting grapevines, posing an increasing threat to vineyards worldwide. The bacterial agent causing the disease is spread by the American grapevine leafhopper. We present a compartmental model for the spread of flavescence dorée incorporating stage structure in the vectors. To account for seasonal weather variations and the behaviour of the vectors, we consider periodic transmission, birth and death rates. We calculate the basic reproduction number as the spectral radius of a linear operator and show that it serves as a threshold parameter for disease persistence. Finally, we provide numerical simulations to assess the effect of varying key model parameters.

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