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STEADY STATE CONCENTRATION FOR AN EVOLUTIONARY EPIDEMIC SYSTEM

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In this talk, we construct a model to describe the evolutionary epidemiology of spore producing asexual plant pathogens in a homogeneous host population. The host population is subdivided into compartments (Susceptible or healthy host tissue (S), Infected tissue (i) and Airborne spores (A)). By considering the evolution in the space of the pathogen phenotypic values, we derive an integro-differential equation with nonlocal mutation terms. Our first main result is concerned with the existence and uniqueness of the endemic steady state of the model. Next assuming that the mutation kernel depends on a small parameter $\varepsilon > 0$ (the variance of the dispersion into the space of the pathogen phenotypic values), we investigate the concentration properties of the endemic steady state in the space of phenotypic values. In the context of this work, several Evolutionary Attractors (as defined in classical adaptive dynamics) may exist. However, in rather general situations, our results show that only one Evolutionary Attractor persists when the populations are at equilibrium and when ε is small enough. Our analysis strongly relies on a refined description of the spectral properties of some integral operator with a highly concentrated kernel. We also provide some numerical simulations of the model to illustrate this concentration phenomenon.

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