SPREADING FOR A REACTION-DIFFUSION SYSTEM WITH FORCED SPEED

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In this work, we study a compartmental model using a partially degenerate reaction-diffusion system to describe the dynamics of the mosquito population under biological control with the Sterile Insect Technique. This technique consists of mass releases of sterilized male mosquitoes that mate with indigenous females yet produce no fertile offspring. Our model considers a release in a 'forced' moving interval in the opposite direction to the natural propagation. We prove that for a sufficiently large number of sterile males released, the population spreads at the same speed as the release and the zero state invades the persistent state, which means we successfully reverse mosquito propagation. The proofs rely on constructing generalized sub- and super-solutions by gluing elementary functions suitably. In the one-dimensional case, we study the monostable system in which the population initiating from any non-trivial, compactly supported initial data persists and spreads in the whole space. We design an exponentially decreasing release function to avoid the reinvasion phenomenon in this monostable case. The results are generalized to the 2D problem for both bistable and monostable systems.