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A Cellular Automaton Modeling Approach to Chestnut Blight Canker Development

The fungal pathogen *Cryphonectria parasitica* (CP) causes cankers on American chestnut trees (*Castanea dentata*). These cankers kill the branch or trunk if the canker girdles the infected branch. Treating cankers by introducing hypovirus-infected CP (HCP) as a biological control has been used to increase chestnut tree survival. Chestnut trees are able to survive infection if the tree can compartmentalize the CP and prevent it from girdling the tree. However, the mechanics of canker development remain poorly understood. We propose a cellular automaton as a model of canker development over time to theoretically test tree survival and the effectiveness of HCP treatment. The results of the cellular automaton predict the likelihood of a branch surviving a canker based on branch size and fungal virulence. In general, survival rises with increases in branch circumference and decreases in fungal growth rate. Ongoing work concerns the effect of HCP treatment on canker development and branch survival. Specifically, we investigate the effects of the treatment's timing and distance from fungal infection.