Translating Macroecological Models to Predict Microbial Establishment Probability in an Agricultural Inoculant Introduction

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Background/Objective

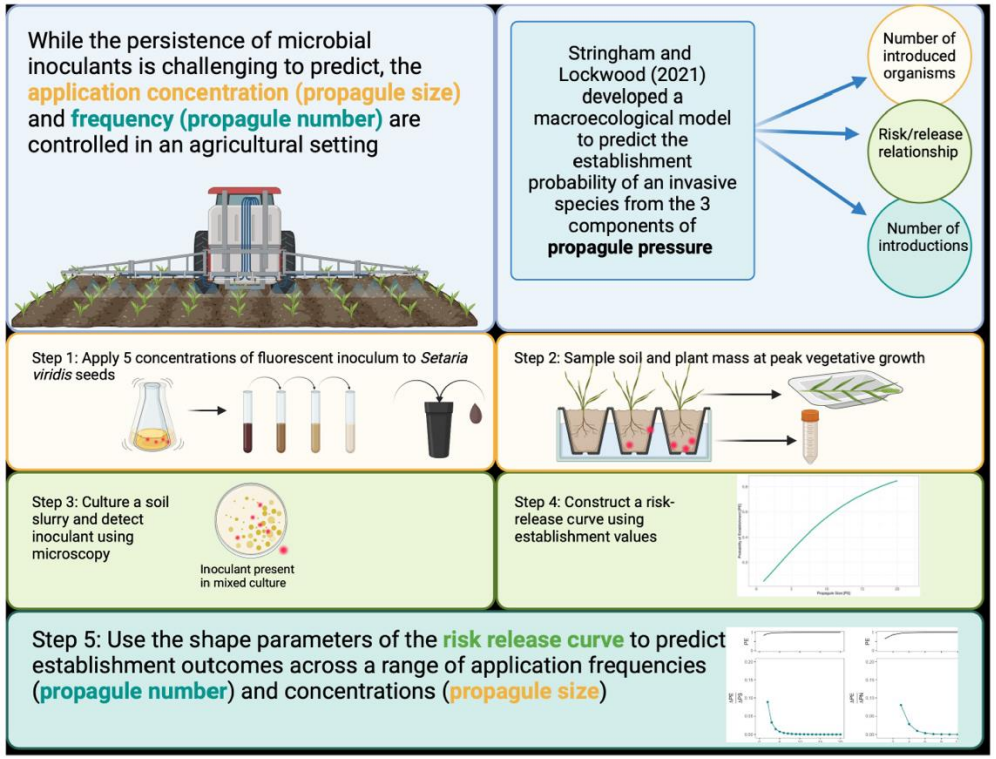
- In the past decade, interest in and application of potentially beneficial microorganisms in agriculture has rapidly increased. One key use of these organisms (microbial inoculants) is as a sustainable supplemental source of limiting nutrients to grain and bioenergy feedstock crops.
- To be effective, microbial inoculants must be able to survive and persist in novel habitats.
- Despite widespread interest in these microbial products, few tools exist to predict outcomes of agricultural microbial introductions and improve inoculant persistence.

Approach

A *Pseudomonas simiae* inoculant was applied to a model monocot system (*Setaria viridis*) to experimentally determine the risk-release relationship. This relationship was used to adapt a macroecological propagule pressure model to a microbial scale and simulate establishment outcomes under different application frequencies and inoculant concentrations.

Results

Repeated inoculant applications may increase establishment, even when increased inoculant concentration does not alter establishment probabilities. Ecological models that incorporate the Allee effect may be appropriate for microbial introductions.



Graphical summary representing background and methods.

Significance/Impacts

This approach demonstrates the potential for ecological models to inform the sustainable use and monitoring of microbial inoculants. Given the similarities between *S. viridis* and promising bioenergy feedstocks such as miscanthus and sorghum, these bioenergy grasses represent one potential system in which the concepts derived from this work might be expanded upon and applied.

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