

Fusarium solani Species Complex Isolation Act as Transkingdom Pathogens in Clinical and Agricultural Environments

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The *Fusarium solani* species complex (FSSC) are a ubiquitous pathogenic filamentous fungal species complex with isolates impacting crops and humans. Previously, a single clade within the FSSC was found to contain the species most frequently responsible for human infections[1]. Over the past several years the same species within the FSSC have been isolated from cotton and soybean fields in Alabama. This project sought to examine the host range of these pathogens and analyze whether clinical isolates are virulent in agricultural environments, and vice versa.

A variety of assays were conducted using fifty-eight FSSC isolates. The phylogeny of these isolates can be seen in Figure 1.

These highlighted in green represent *F. falciforme* and those in yellow are *F. solani*. Black text represents clinical isolates, blue text are cotton-sourced isolates, and red text are soybean isolates.

One of the main limiting characteristics of a pathogen is its thermotolerance and its ability to grow at mammalian body temperatures. Isolates were plated on Petri dishes containing Martin's medium and were allowed to grow for ten days at 28°C and 37°C. After ten days, the distance from the original plug to the hyphal tip was measured and calculated to find its percent inhibition, as seen in the equation below[2].

$$\text{percent inhibition} = \frac{(\text{distance at } 28^{\circ}\text{C}) - (\text{distance at } 37^{\circ}\text{C})}{\text{distance at } 28^{\circ}\text{C}} \times 100\%$$

This assay revealed that the greatest inhibition was less than 50%, indicating all clinical and agricultural FSSC isolates were able to grow prolifically.

The next set of assays is meant to analyze whether the clinical FSSC isolates can be virulent in an agricultural environment. This was completed through inoculating carrots and cucumbers with a small plug of each isolate, and allowing them to incubate at room temperature for seven days. These assays showed a consistent ability of isolates to be capable of infecting these models.

In the future, the virulence of the isolates will be analyzed in a potato model. Additionally, the isolates will be used to infect hydroponic cotton and soybean models. This will be particularly notable with the agricultural isolates, to show yet another example of their wide-ranging virulence. Finally, the isolates will be used to infect *Galleria*, a heterologous insect model. This will

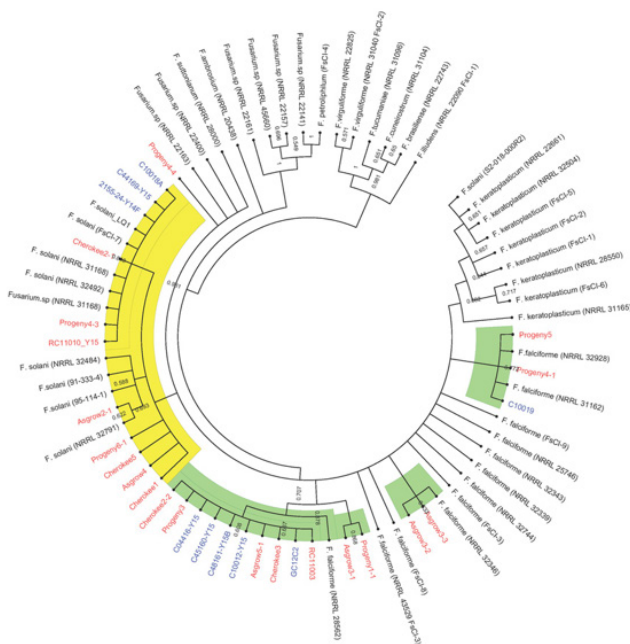


Fig. 1. Phylogeny of the FSSC isolates utilized.

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evaluate whether the agricultural isolates are capable of the level of infection as clinical isolates in this scenario [2].

Statement of Research Advisor

Members of the FSSC have been well established as pathogens of agriculturally important crops, animals, and humans. Harrison's research has begun to evaluate the pathogenicity of environmental and clinical isolates on a broad range of potential hosts. Interestingly, his initial studies have indicated that FSSC isolates collected from the environment may have the potential to cause human infections, while those from a medical setting can infect some crops.

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Jeffrey J. Coleman is an Associate Professor in the Department of Entomology and Plant Pathology at Auburn University. After obtaining his Ph.D. in Plant Pathology at the University of Arizona, Dr. Coleman conducted postdoctoral research in medical mycology at Harvard Medical School. Since joining the faculty at Auburn University in 2014, he has developed a laboratory focused on investigating fungal pathogenesis using advanced molecular techniques.

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Authors Biography



Harrison P. Estes is a fourth-year student pursuing a B.S. in Applied Biotechnology and minoring in Public Health at Auburn University. Since 2020, he has played key roles in the analysis of various FSSC isolates as transkingdom pathogens. Following his graduation in May 2023, he will pursue a Ph.D. in Genetics as a National Science Foundation Graduate Research Fellow from the University of Wisconsin-Madison, where he will focus on fungal genetics, microbial interactions, biopharmaceuticals, and biofuels.