Characterization of two poorly understood strawberry fruit rots: Rhizopus and Mucor

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Fruit rots cause major losses in California strawberry production, with Botrytis fruit rot predominating in colder, wetter months, and Rhizopus and Mucor fruit rots in warmer months. The causal agents, *Rhizopus* and *Mucor*, are difficult to differentiate due to overlapping symptoms and signs. Because of this, they are often grouped together, limiting research on management and species-specific information. To address these research gaps, this study aims to determine the prevalence, species composition, and management characteristics of these pathogens across California's three major strawberry-growing regions. To determine prevalence, isolates will be collected from each district. As of June 2026, 200 isolates have been collected from rotting fruit in strawberry production fields or from harvested fruit in clamshells using sterile cotton swabs. Each isolate was identified to species through culture isolation, DNA extraction, sequencing, and local sequence alignment analysis. Findings from 130 isolations resulted in 119 (90.8%) *Rhizopus stolonifer* isolates, 2 (1.5%) *R. arrhizus* isolates, 7 (5.3%) *Mucor piriformis* isolates, and 3 (2.3%) *Gilbertella persicaria* isolates. Observable differences in growth habits and spore appearance (Fig. 1) between *Rhizopus* and *Mucor* are evident. These features allow rapid and accurate field identification with the naked eye or aided by a 20× loupe. Identifying these differences is an important foundation for optimizing management practices. Future work on this project will include collection of another 100 isolates, identification of all remaining isolates, evaluations of optimum growth temperatures, fungicide efficacy, and their implications for disease management.

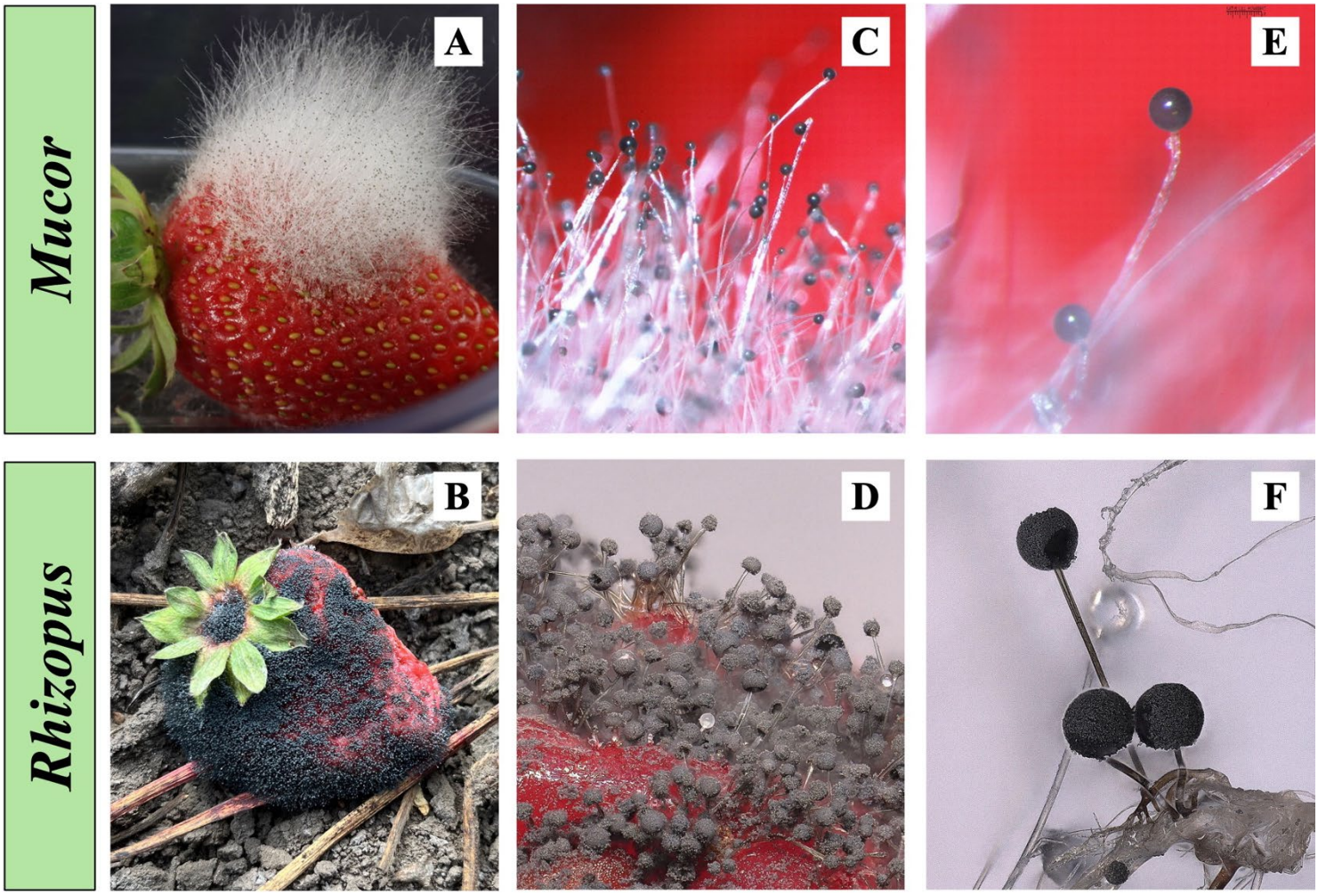


Figure 1. Comparison of the growth habit and sporangiophore morphology of *Mucor piriformis* and *Rhizopus stolonifer*. A) *M. piriformis* and B) *R. stolonifer* growth habit on diseased fruit. *Mucor* colonies form dense, white, wiry patches on the fruit. *Rhizopus* colonies appear darker and typically form closer to the fruit surface, except under high humidity. C) *Mucor piriformis* and D) *Rhizopus stolonifer* sporangiophores. E) *M. piriformis* sporangiophores and F) *R. stolonifer* sporangiophores at higher magnification. *M. piriformis* forms sporangial drops, making its sporangia glisten. *R. stolonifer* does not produce sporangial drops; its sporangia are dry and powdery.