

MINNESOTA—Improve Alfalfa Seedling Establishment: Understand & Manage Wet Soil Syndrome
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Establishing productive and healthy alfalfa stands is dependent on rapid and uniform seedling emergence. Pathogens causing seed rot and seedling damping-off plague alfalfa seedlings, leading to decreased stand health and an overall decrease in yield over a stand's life. Research tested the efficacy of fungicides applied as seed treatments for control of alfalfa seed rot and damping-off under field conditions, and worked to identify microbial communities (bacteria, fungi, oomycetes) associated with infected alfalfa seedlings and soil samples from sites with poor alfalfa establishment. Trials were conducted in WI in 2020 and 2021 in fields with previous alfalfa stand establishment issues. Preliminary results from these trials and growth chamber studies indicated fungicide seed treatments may aid in stand establishment and increase forage yield in the establishment year. Growth chamber assays indicated fungicide seed treatments help protect alfalfa from *Pythium* species and *Phytophthora* root rot but did not control *Aphanomyces* root rot. Results indicate experimental fungicides not currently labeled for alfalfa can be used as alternatives to fungicides currently used. Microbial community analysis revealed *Aphanomyces* root rot was the dominant pathogen in WI field trials followed by *Phytophthora* root rot, with numerous *Pythium* species identified near alfalfa roots. Several previously unrecognized novel alfalfa pathogens were identified in relatively high abundance, which could be contributing to seed rot and damping-off in wet soils. Quantitative assays confirmed the relative abundance of the seedling pathogens and bioassays found race 2 of *Aphanomyces* root rot dominated over race 1 at field locations. Sequencing of the microbial community was found to be a rapid and robust means of identifying pathogens that may be contributing to alfalfa seedling diseases. Results from this study will inform future alfalfa breeding efforts to enhance disease resistance with the goal of increasing profitability for alfalfa farmers that are plagued with alfalfa establishment failures due to wet soil syndrome.