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ADVANCING ALFALFA BREEDING AND PRODUCTION RESEARCH

ARS prioritizes improved alfalfa production and use for producer success and environmental quality. Alfalfa is the fourth largest U.S. crop commodity, contributing more than $10 billion annually to the U.S. farm economy. Dairy and beef producers feed alfalfa to their cattle for its high protein and energy content. Alfalfa fixes approximately 300 pounds of nitrogen per acre per year, disrupts pest cycles, is a major nectar source for honeybees, and can grow well under dry conditions, making it valuable in crop rotations. The following accomplishments highlight ARS advances in alfalfa research in FY 2019.

Alternative fungicide for protecting alfalfa seeds. Almost all alfalfa seed is treated with mefenoxam. However, this fungicide is not active against the pathogen causing *Aphanomyces* root rot, a lethal widespread disease of alfalfa, nor against fungal seed rot pathogens. ARS researchers in St. Paul, Minnesota, developed a commercial fungicide mixture effective against all alfalfa seed rot and damping off pathogens, now providing alfalfa growers with much needed relief.

Planting alfalfa in corn grown for silage protects soil and water resources. ARS researchers in Madison, Wisconsin, found that alfalfa planted among corn rows reduced the loss of soil and nutrients from cropland by 40 to 80 percent compared with a conventional system in which alfalfa was planted in the spring, 7 months after corn harvest. Intercropping alfalfa with corn was also effective in reducing the risk of nitrate leaching into groundwater. Consequently, intercropping alfalfa with corn holds promise for improving farm profitability and protecting the environment.

Alfalfa cyst nematode found in North America identified and characterized. ARS scientists from Beltsville, Maryland, along with researchers from Idaho, Kansas, and Nebraska, have discovered the first evidence of alfalfa cyst nematode in North America. Plant-parasitic nematodes such as alfalfa cyst nematode cause nearly $10 billion in crop losses annually in the United States. Plant pest management specialists and regulatory officials will now use the evidence of this potentially emerging threat to the alfalfa industry to contain the nematode and prevent inadvertent movement to additional areas.

Condensed tannins play an important role in alfalfa resistance to root lesion nematode. Alfalfa usage for grazing beef cattle has been limited due to its propensity to cause pasture bloat, a potentially lethal condition in cattle. ARS researchers in Beltsville, Maryland, have been working for years to produce tannins in the leaves and stems of alfalfa, which can beneficially impact digestion to prevent pasture bloat in ruminants. Recently, these researchers discovered that alfalfa roots produce tannins as a defense mechanism against root lesion nematode infection. ARS researchers can now leverage knowledge of this mechanism to develop alfalfa cultivars with tannin-rich leaves.

New DNA markers for drought resistance and salt tolerance in alfalfa. Drought resistance and salt resistance are important for enhancing alfalfa productivity in arid and semiarid regions. An ARS scientist in Prosser, Washington, identified genetic markers associated with these traits and developed eight drought-tolerant and salt-resistant alfalfa lines. ARS has transferred these lines to Alforex Seed Company to breed alfalfa cultivars with increased drought resistance, salt tolerance, and water use efficiency.