

## Bacterial Stem Blight of Alfalfa: Connection with Frost Damage, Development of Resistant Germplasm, and Mapping Resistance Genes

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Once alfalfa breaks dormancy in the spring, it is vulnerable to frost damage. The risk of frost damage is increased by the presence of certain ice nucleation-active bacteria on plant surfaces that initiate the formation of ice crystals. In the Intermountain West, alfalfa producers and extension professionals have observed significant damage from frosts in both spring and fall, setting back growth and reducing yields. Associated with frost damage is damage from the disease bacterial stem blight (BSB), caused by an ice nucleation-active bacterium, *Pseudomonas syringae* pv. *syringae*. The bacterium promotes frost formation, penetrates stems at frost injury sites, and subsequently decays leaves and stems. Currently there are no cultivars with resistance to BSB and little is known about the disease in the field. Most alfalfa producers and researchers are unfamiliar with the disease. Our goal is to understand the disease cycle and develop tools for reducing losses due to the disease. We will be conducting surveys to determine the extent of the disease and to educate growers about the disease and the relationship with frost damage. Our studies will include experiments to determine the source of the pathogen and follow its growth over several years. This information will be valuable for determining when protective action can be taken to reduce bacterial populations. One of the most effective means to combat plant diseases is genetic resistance. We will identify the regions in the alfalfa chromosomes that have genes for resistance to the disease and develop markers that will allow plant breeders to quickly and efficiently identify plants with resistance. We will develop methods for selecting disease resistant plants and carry out several cycles of plant breeding to develop novel germplasm with resistance to the disease. The research will help ascertain how common the disease is in frost-prone areas and will help educate alfalfa researchers and producers on the importance of this disease, how to recognize it, and ultimately how to avoid it. By creating BSB resistant cultivars, we can provide improved frost tolerance to producers. This research should improve yields in frost-prone areas, which represent a significant percentage of the alfalfa acreage nationwide.