

## **DROUGHT, SALT TOLERANCE IN ALFALFA THE FOCUS OF SCIENTISTS AT USDA'S ARS**

The Agricultural Research Service's (ARS) Forage & Range Research Lab in Logan, UT, is enhancing resistance in alfalfa to drought and high salinity through the use of molecular markers. The work, led by a team of researchers headed by Michael Peel, has two primary objectives: 1) to develop diverse alfalfa populations to identify genes conditioning drought/salt tolerance; and 2) to develop molecular markers and strategies for the selection of drought and salt tolerant alfalfa and breeding for superior varieties with drought and salt resistance.

At the present time four cycles of selection have been completed for relative salt tolerance in alfalfa using the greenhouse method. This recurrent selection scheme has resulted in two populations of alfalfa that will be utilized in this study that were selected for increased germination and plant growth in the presence of salt. One population was derived from sativa-type dryland alfalfa cultivars and from cultivars previously reported to have some tolerance to saline conditions. The other population was selected from a drought-tolerant type alfalfa.

These drought- and salt-tolerant alfalfa populations will be evaluated in different field locations to determine relative forage production, fall dormancy, flowering date, seed production, and forage quality. In addition plant traits such as root length and thickness, root penetration ability, drought resistance index, relative leaf water content, and osmotic adjustment of these lines will be compared with standard checks. It is hypothesized that alfalfa genotypes will be identified from among these populations that would meet commercial standards for forage production under drought and saline conditions.

In the fall of this year the maternal half-sibling families will be planted at sites in Prosser, WA, and Logan, UT, and will be planted according to a randomized complete block experimental design with three replicates. Field trials at both sites will be grown under deficit irrigation management to impose significant water stress on the alfalfa field plots.

During 2017 to 2019, forage biomass will be measured on all plots. Immediately before each harvest, relative water content will be measured to monitor alfalfa water status during each growing season. Forage samples will be collected to measure forage quality parameters.

To measure forage production under salt stress, the plants will be treated with a solution that will have an EC (electrical conductivity) reading that will be sufficient enough stress to separate genotypes based on forage production without high mortality. Plants will be cut to a height of 5 centimeters at the onset of salt treatment and allowed to grow for five weeks before the forage biomass is harvested. This protocol can be repeated on the same plants by treating the plants with non-saline solution for one week and then repeating the salt treatment process.

Although this initial work will focus on developing forage legumes for rangelands in the western United States, it could likely lead to drought and salt tolerant varieties that will work in other areas of the country as well.