Part 2: Alfalfa Breeders Start Collaborative Program to Bring Germplasm out of the Repository; Others Invited to Join the Effort

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In an effort to utilize more than 4,000 alfalfa (*Medicago sativa L.*) plant introductions in the National Plant Germplasm System, a small group of alfalfa breeders in the North American Alfalfa Improvement Conference (NAAIC) is creating pre-commercial alfalfa germplasm that could be used in commercial breeding efforts. Current participants include USDA-ARS and DuPont Pioneer, but other alfalfa breeding entities are invited to join the effort.

The National Plant Germplasm System (NPGS) is a cooperative effort by public (state and federal) and private organizations to preserve the genetic diversity of plants. Scientists must have access to genetic diversity to help bring forth new varieties that can resist pests, diseases, and environmental stresses. The NPGS aids the scientists and the need for genetic diversity by acquiring, preserving, evaluating, documenting, and distributing crop germplasm. There are 26 repositories across the U.S. for everything from alfalfa to zucchini.

The NAAIC has discussed/proposed pre-breeding efforts to utilize this germplasm for creating pre-commercial alfalfa germplasm, but funding is limited. So this project utilizes a collaborative alfalfa pre-breeding program supported through "in-kind" breeding activities (i.e., disease screening, nursery evaluations, seed increases). The goal is to create publicly available alfalfa germplasm from selections out of the NPGS collection.

Current participants are in colder northern American climates, so the 150 plant introductions chosen for the initial work are classified as advanced breeding material, cultivars, or landraces spanning the Eurasian continent in USDA winter hardiness zones up to seven. In the spring of 2013, plants from each accession were planted at two Wisconsin locations (Dairy Forage Research Center farm, Prairie du Sac and DuPont Pioneer alfalfa research station, Arlington). Plant vigor notes were taken that fall. Initial analysis revealed a multiple regression model of plant vigor score (scale: 1-worst to 9-best) with latitude and longitude. The two independent trends were: 1) western Eurasian plant introductions do better than eastern Eurasian plant introductions (stronger trend), and 2) southern Eurasian plant introductions do better than northern Eurasian plant introductions (weaker trend). Riday and Brummer (2005) observed a similar trend in subspecies falcata germplasm. Future intensive plant evaluation and selection will follow on these nurseries.

Other objectives for this initiative may include: intensive focus on creating a central-Asian breeding pool (Bhandari et al., 2007); using DNA markers to ensure "distinctiveness" of selected germplasm; and exploring climate of origin factors associated with performance. Sampling more genotypes from the best plant introductions and evaluating additional plant introductions from key Eurasian regions will likely follow. The mission of the NAAIC is to promote the development of improved alfalfa cultivars and management practices through education, communication, and professional development of research scientists, educators, and commercial representatives in North America and around the world.