

Alfalfa Varieties Now and in the Future from CAL/WEST Seeds

Lauren Johnson, David Johnson, and Jon Reich.

CAL/WEST Seeds is a grower-owned seed production cooperative. It started out in the 1930s as two individual ladino clover seed growing cooperatives, Caladino Farm Seeds and Cal-Approved. These two companies merged in 1969 to form CAL/WEST seeds.

CAL/WEST was among the first companies in the U.S. to initiate private alfalfa breeding research and has been involved with alfalfa breeding since 1959. We are currently involved in research and production of dormant and nondormant alfalfa, ladino clover, red clover, berseem clover, birdsfoot trefoil, sudangrass (both open pollinated and hybrid), safflower, and dichondra. CAL/WEST Seeds is a wholesale company. We develop the varieties, produce, clean, and bag the seed, and market the seed to retail seed companies that sell our varieties under their own brand name under exclusive license agreements.

CAL/WEST Seeds has research stations in Woodland, CA, and West Salem, WI. Seed cleaning and conditioning facilities are located in CA and Washington. We test varieties in both private and public testing programs throughout the alfalfa growing areas of the US and Canada. We also test our varieties in several foreign countries including Argentina, Mexico, France, Australia, South Africa, and Saudi Arabia.

Our breeding program has always focused on traits that help determine on-farm profitability. Every variety advanced in our program must have very high yield potential, good stand persistence, broad adaptation, and resistance to the major diseases and insects. In addition, varieties have been developed with improved forage quality (improved digestibility), grazing (and traffic) tolerance, higher seed yield, salt tolerance, rapid recovery, improved standability, and increased fall and winter growth (fall dormancy 10). Higher resistance levels have been developed for several important diseases and insects including northern root knot nematode, potato leafhopper, *Aphanomyces* race II, and cowpea aphid.

We are currently bringing to market alfalfa varieties with the StandFast™ technology. These varieties have become the new standard for rapid recovery and standability in dormant alfalfa. StandFast™ fall dormancy 4 and 5 varieties recover and grow up to 30% faster (measured as cm/day) than elite conventional varieties of similar dormancy. In addition, significantly improved standability has been developed in this product line. This is important in parts of the country where growing conditions result in lodging which reduces yield, quality, and harvest efficiency.

During the last few years the cowpea aphid has become a major pest throughout the Southwest and it seems to be increasing in other parts of the country as well. We have selected extensively for resistance to this aphid both in nondormant and dormant germplasm. Semi-dormant and nondormant varieties with excellent resistance will be commercially available soon, with resistant dormant varieties following shortly after.

We have also been developing varieties with salt tolerance. Selection for emergence and survival at the seedling stage under moderate salinity stress, as well as selection for yield of the mature plant when grown in saline soil has been effective. We will be

releasing varieties soon that retain more yield when grown under salty conditions.

We are currently involved in two biotech projects and are negotiating a license agreement for a third technology. The first project involves developing alfalfa varieties with improved leaf retention using a gene that limits leaf senescence. Leaves senesce in an alfalfa canopy due to a number of factors including aging, shading, and leaf disease or other injury. In our field studies we have demonstrated significantly reduced leaf loss. We have also documented slower rates of colonization by leaf diseases. Varieties developed with this technology have the potential for higher quality, higher yield, and improved leaf disease resistance. This trait may be especially important in areas where weather impacts cutting schedules. If a cutting is delayed, leaf retention becomes even more of a factor.

Our second biotech initiative involves technology that modifies senescence early in the physiological process at the subcellular level, rather than limiting leaf or tissue senescence. Typically as a plant grows throughout its life cycle, it encounters a number of minor or major stresses. Each of these stresses slow or even stop growth for a short time. Utilizing this new technology, we plan to develop varieties that show continuous linear growth, which should result in significant improvements in yield and in stress tolerance.

Alfalfa variety development in the past has focused on basic germplasm enhancement, resulting in varieties that have good forage yield, broad adaptation, enhanced quality characteristics, and multiple pest resistance. In the future, many alfalfa varieties will be developed through a combination of conventional breeding and biotechnology resulting in trait-specific value added products.