Recent Advances in Legume & Grass Breeding

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When it comes to pasture grasses or non-alfalfa forage legumes, there are not many public or private breeding or research programs in the U.S. The main reason is the seed markets are just too small for these forage plants; seed companies need to know that they can sell enough seed to recoup their costs before investing in a breeding program to develop a new and improved variety.

But among grazing-based livestock producers, there is a great need for improved varieties of grasses and legumes that fit a special niche or address a specific concern. The U.S. Dairy Forage Research Center (USDA Agricultural Research Service), Madison, WI, is developing some improved varieties; the current focus is on non-alfalfa legumes for pastures, grass for pastures, and yellow (*falcata*) alfalfa for a reduced cutting schedule in field harvest systems. Some new varieties should be on the market in a few years, and others are still looking for a seed company to bring them to the commercial market. Here is an update:

A more persistent red clover variety, shown here in variety trials, is now undergoing seed increase by a commercial seed producer.

Red Clover ...

Red clover (*Trifolium pretense L.*) is an excellent forage legume for grazing systems. It has excellent seedling vigor and broad establishment versatility, and is highly digestible. Historically, red clover has been limited by its lack of stand persistence, but plant breeding has improved red clover persistence over the past 50 years.

A red clover variety, developed by Heathcliffe Riday at the U.S. Dairy Forage Research Center, which demonstrates greater persistence than current red clover varieties has been licensed and is currently undergoing seed increase with the hope of having commercial seed available in the next couple of years.

Kura Clover ...

Kura clover (*Trifolium ambiguum M.*) is somewhat the opposite of red clover. It is very difficult to establish; but once it is established, it is almost indestructible, making it ideal for permanent pastures. Grazing-based dairy producers have been asking for improved varieties of Kura clover (Kura clover seed now being sold is not a named variety). Heathcliffe Riday's Kura clover breeding program at the U.S. Dairy Forage Research Center has focused on improving establishment and yield.

However, while the indestructible nature of Kura clover makes it ideal for pastures, it makes it undesirable for seed companies; there is not a huge seed market for something that is planted only once and then persists for many years. Riday reports that his breeding program has discovered a Kura clover variety (Kura 1) that has good establishment vigor, spreading ability, and dry matter production. But he has not found a seed company willing to produce and market it.

An improved variety of Kura clover shows good establishment vigor, spreading ability, and dry matter production; unfortunately, seed companies have shown no interest due to the small market potential.

A birdsfoot trefoil from Eastern Europe shows promise in terms of dry matter production and its capacity to tolerate frequent defoliation. It is in the early stages of development.

Birdsfoot Trefoil ...

Birdsfoot trefoil (*Lotus corniculatus L.*) is also desired by graziers because it does not cause bloat; it contains tannins that improve protein utilization; it persists in soils where red clover does not; and it is productive during dry periods in July and August. 'WITT' birdsfoot trefoil, a variety developed by Richard Smith (now retired) at the U.S. Dairy Forage Research Center, was selected for increased persistence and is currently in the seed production stage at Allied Seed. It could be on the market as soon as 2014 and would be marketed under WITT.

Riday and John Grabber are studying another birdsfoot trefoil variety from the Czech Republic. They have selected plants, produced seed for research, and are now growing and testing these plants. Early results look very promising in terms of biomass production and its capacity to tolerate frequent defoliation (28-day schedule) compared to regular birdsfoot trefoil. But it would be at least five years before a variety would be available commercially.

Yellow Alfalfa ...

For mechanically harvested forages, yellow flower alfalfa (*Medicago sativa subsp. falcata L.*) shows some promise for use in a hybrid alfalfa cross. Compared to purple flower alfalfa (*Medicago sativa subsp. sativa L.*), yellow flower alfalfa is slower to grow in the spring and after each cutting; but it continues to accumulate dry matter as it matures. Riday's breeding program at the U.S. Dairy Forage Research Center has been selecting for varieties with more active early growth.

Riday has also conducted research on hybrid crosses of yellow and purple alfalfa being developed by Dairyland Seed. If successful, such a hybrid could reduce the number of cuttings in an effort to decrease fuel usage, increase stand life, and increase dry matter tonnage.

Meadow Fescue and Orchardgrass ...

Mike Casler, grass breeder at the U.S. Dairy Forage Research Center, has been working on an improved variety of meadow fescue (*Festuca pratensis*) for a number of years. Meadow fescue is highly desired for pastures because of its high forage quality (better than all grasses except ryegrass) but also because it is more drought tolerant and cold tolerant than ryegrass. Casler developed Hidden Valley Meadow Fescue from a remnant pasture in southwest Wisconsin. It showed great promise for grazing-based dairy farms. But it ran into a huge roadblock; although it grew very well in the Midwest, it would not produce seed in Oregon, the major seed production area in the country. Casler is now working to improve the seed production trait in meadow fescue by crossing Hidden Valley with other meadow fescue varieties.

Casler is also trying to breed an orchardgrass variety that does not flower in the spring; this would simplify pasture management by severely reducing the number of flowering stems, which are a huge nuisance to livestock during the spring growth flush. He reports that this is a very tricky process because of the need to produce seed from a plant that is designed to not produce flowers. European ryegrass breeders have been working on this since the 1950s without success. Casler found some very old orchardgrass seed from the USDA Pasture Lab in Pennsylvania from the 1960s. He resurrected this project in 1990 and is partnering with a seed company in Oregon. Results so far are promising, but they are still a few years from having a new variety.