

Fact sheet



U.S. Dairy Forage Research Center
USDA-Agricultural Research Service
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Increasing Persistence in Pasture Legumes: Red Clover • Kura Clover • Birdsfoot Trefoil

Improving pasture legume persistence or longevity has been a goal of plant breeders for years. At the U.S. Dairy Forage Research Center (USDFRC), the legume breeding program emphasizes non-alfalfa pasture legumes. Ideally, grazed forage intake should be around 30 percent forage legume dry matter. Forage legumes are a good protein source for animals and nitrogen source for the soil.

Due to various natural conditions and management practices, grasses persist better than legumes in pastures. However, progress is being made toward keeping legumes in pastures for longer periods. Here's an update on ongoing research at the USDFRC.

Red clover

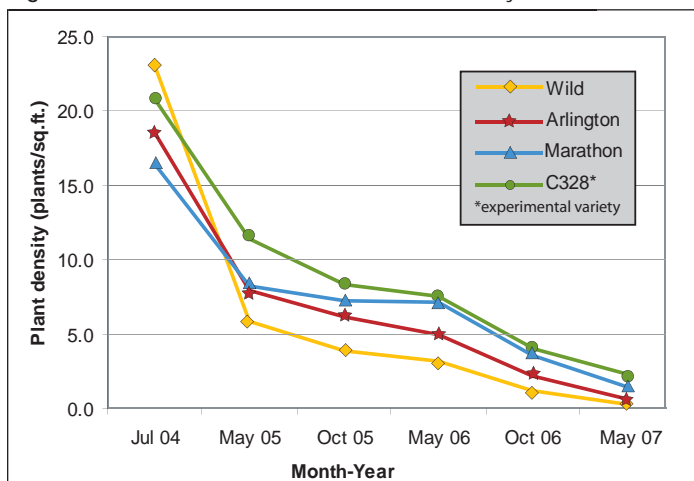
Red clover (*Trifolium pretense L.*) is an excellent forage legume for grazing systems. Red clover has excellent seedling vigor and broad establishment versatility, and it is a great pasture protein source. Historically, red clover has been limited by its lack of stand persistence in hay and grazed systems compared to other small-seeded forage legumes such

as alfalfa. Breeding over the past 50 years has extended red clover persistence in hay management systems up to four years. However, no trials had examined grazing tolerance of historic and current red clover varieties.

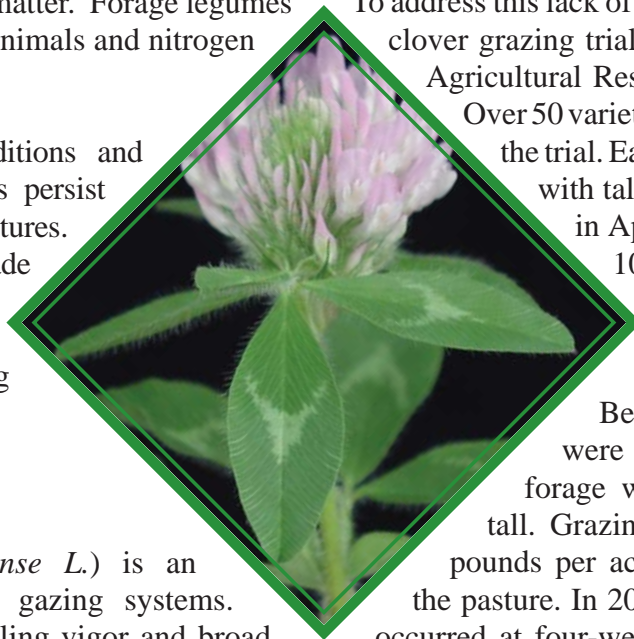
To address this lack of information, we conducted a red clover grazing trial at the University of Wisconsin Agricultural Research Station at Lancaster, WI. Over 50 varieties of red clover were included in the trial. Each variety was seeded in mixture with tall fescue (*Lolium arundinaceum*) in April of 2004. Seeding rates were 10 pounds per acre of red clover seed and 10 pounds per acre of the tall fescue.

Beginning in June 2004, stands were rotationally grazed when the forage was between 12 and 15 inches tall. Grazing lasted 24 hours with 40,000 pounds per acre of cow-calf pairs grazed on the pasture. In 2004 and 2005 the grazing events occurred at four-week intervals. In 2006 and 2007 grazing occurred in three-week intervals in order to increase grazing stress on the pasture plants. We measured plants per square foot in July of 2004, in May and October of 2005 and 2006, and in May 2007. We concluded:

Figure 1: Persistence of red clover varieties over 3 years.



- Persistence of modern compared to historic Wisconsin benchmark varieties used in the last 50 years has increased (Figures 1 and 2).
- Among modern versus older red clover varieties *in general*, no increase in persistence is observed; this indicates that relying on newer red clover varieties alone to increase grazing tolerance is not enough; you must look for newer varieties with a measurable improvement.
- Varieties currently under development at the USDFRC generally show an even greater increase in persistence than recent benchmark varieties.

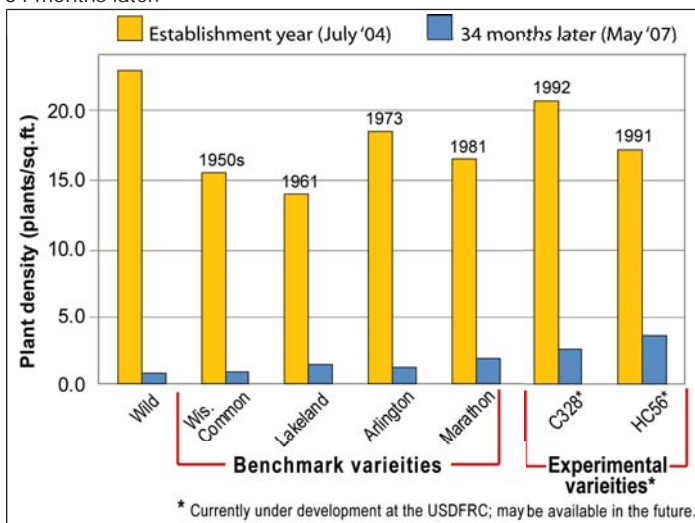


Kura clover and birdsfoot trefoil

Kura clover (*Trifolium ambiguum* M. Bieb.) is somewhat the opposite of red clover. It is very difficult to establish; but once it is established, it's almost indestructible, making it ideal for permanent pastures. That's why we chose to focus on this species. Our research goals include improving kura clover establishment and yield. In a joint effort between the USDFRC and the University of Wisconsin (Ken Albrecht), we have publicly released an experimental variety of kura clover named 'Kura1'. Selection for improved kura clover varieties out of Kura1 are currently in progress. During the fall of 2007 we discovered a Kura1 derived family that had good establishment vigor, spreading ability, and dry matter production. Initial seed increases of this family will occur over the next two years. An improved kura clover variety could be available to farmers within the next 5 years.

To see if farmers can blend kura clover and red clover for a more consistent legume-grass ratio over the life of a pasture stand, in 2005 we initiated some seed mixture trials at two Wisconsin locations. Our thought is that the red clover, which is easy to establish, could provide the pasture with legumes for the first few years while the kura clover slowly establishes; then after a

Figure 2: Persistence of red clover as measured from establishment to 34 months later.



Contact:
 Heathcliffe Riday, Research Plant Geneticist
 608-890-0077
 heathcliffe.riday@ars.usda.gov

few years the kura clover would be well established as the red clover starts to die off. We have no results from these trials to date.

'WITT' birdsfoot trefoil (*Lotus corniculatus* L.), a variety developed by Richard Smith (now retired) of the USDFRC, has received new interest. Plant Variety Protection is pending for the variety. The variety should soon enter seed production, with seed possibly being commercially available in 2009 or 2010. WITT has been selected for increased persistence and shows increased persistence in Wisconsin variety trials during the third year of stand compared to varieties Leo, Norcen, and Viking (Figure 3).

Frost Seeding

Frost seeding is a popular way to reestablish legumes into pastures without turning the soil. However, in Wisconsin, about 30 percent of the time there is complete failure with this process. At the USDFRC we are in the early stages of research that attempts to find solutions to this problem. In one study we are trying to determine if there is a genetic variation related to the success rate of frost seeding. If we find genetic variation, we will start a selection program for frost seeded establishment.

Figure 3: Persistence of WITT birdsfoot trefoil as compared to three other varieties.

