History of Wisconsin *Medicago falcata* (WISFAL)

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WISFAL is a derived tetraploid synthetic of *M. falcata* that was developed by backcrossing tetraploidy into diploid *M. falcata* using 2n eggs (Crop Sci. 30:1353-1354, 1990). The original goal was to produce a tetraploid *M. falcata* for direct crossing and gene flow to cultivated alfalfa. WISFAL is being used this way in a number of experiments. The goal now is to make a derivative of WISFAL available which has proven persistent under grazing. The groundwork for this goal began when WISFAL was released and placed in the Plant Introduction System (Crop Sci. 33;217-218 1993; PI 560333). At this time, 10 to 20 pounds of seed was distributed to each of several public and private researchers. Fortunately, a planting on Larry Smith's farm near Viroqua, WI, was maintained for ten years and revealed the potential of WISFAL survivors in a permanent pasture (see the report by Larry Smith). As Smith reports, there is an impressive number of plants after ten years, and counting. Since there likely has been selection for adaptation under grazing on the Smith farm, the survivors may have a different genetic composition than original WISFAL. Hence, the Smith population will be termed FALCATA for the time being, and a distinguishing prefix or suffix added later.

This on-farm experience made Smith and Bingham appreciate that FALCATA, because of its persistence, could be a component of permanent pastures and provide nutrition, runoff control, nitrogen, and eliminate future pasture renovation. What happened on the Smith farm mimics what has been experienced in South Dakota over the past 100 years. For example, see the article in Agricultural Research/October 2003. The article reviews the spread of *M. falcata* in Western SD since its introduction there around 1915.

Parents of WISFAL

The original 22 diploid *M. falcata* Plant Introductions used in the development of WISFAL included 16 Plant Introductions, plus five diploid *M. falcata* accessions from various regions of Russia that Professor R.A.Brink, UW-Madison, had obtained directly from a Russian scientist prior to World War II. Most of the *M. falcata* lines had shown some tolerance or resistance to the alfalfa weevil, which was invading Wisconsin in the late 1960s. The PI numbers are reported in Crop Sci. 15:889, 1975.

In the late 1960s, we were using diploid *M. falcata* in several genome and polyploid manipulations (reviewed in Crop Sci. 14:474-477, 1974), and we learned how to make diploids into tetraploids using sexual reproduction. It also was known that prominent cultivars like Narragansett and Vernal had diploid *M. falcata* in their pedigrees, and we argued that a derived tetraploid form of M. falcata would permit even greater use of the germ plasm. Hence, we went to work developing WISFAL.

Steps in the Development of WISFAL

First, a diploid (2x) *M. falcata* synthetic 2x WISFAL-1 was produced by intercrossing selected plants of 17 diploid M. falcata lines. Then, a sample of plants from the 2x WISFAL-1 population was pollinated with pollen of a tetraploid (4x) *M. falcata* X *M. sativa* hybrid from a previous experiment. This type of 2x –4x cross typically produces a few 4x progeny by selective functioning of eggs with the unreduced 2n =2x chromosome number, and 18 such 4x progeny were produced. These new 4x progeny containing 75% *M. falcata* germ plasm were used as the pollen source in the next round of 2x –4x crosses, and the process was repeated five times. The number of tetraploid progeny produced over the five backcrosses ranged from 10 – 18. The last backcross involved five 2x WISFAL-1 parents that each produced two 4x progeny for a total of ten tetraploid progeny. These ten parents of WISFAL were intercrossed in the greenhouse in 1988 to produce the initial synthetic generation (reported in Crop Sci. 30:1353-1354).

In 1991, the next synthetic generation was produced on a half-acre field isolation at Prosser, WA. Support was from Regional Project NC-83, with Richard Peaden in charge at Prosser. Pictures that follow were taken at Prosser in mid-August, 1991. About 20 pounds of seed of this generation was given to Larry Smith for planting on his farm.

Steps in the Development of Smith FALCATA

See the report by Larry Smith for details about how the pasture containing FALCATA was managed for the first nine years. Then, in the tenth year, 2003, Smith removed the cattle in May and let the pasture flower and produce seed. In early August when the first seeds were dry and buckskin, a sample of pods was harvested by hand to ensure obtaining a genetic sample of seed at the site in case a wet spell set in. No wet spell occurred, and the plants kept setting seed indeterminately. By mid-August, the decision was made to harvest the material and let it dry under cover where typically there is less shattering of dry pods, and buckskin and some green pods will yield viable seed. This harvest was accomplished by cutting and carrying the material to drying racks made of farm gates placed in a nearby barn. The material was allowed to dry slowly for about a month, threshed with a leaf shredder, and bagged to await further fanning and cleaning. About 30 pounds of seed was obtained, and the exercise was considered a success. This seed was used to establish two small fields on the Smith Farm in May 2004, for seed production.

The project has the attainable goal of leaving more FALCATA on the planet than there was when we started, and each of the coming years is expected to contribute to this goal. Information will be posted on this website.

WISFAL seed production fields at Prosser, WA, August 1990