Appendix 2

NZ Experience `Medicago falcata'

Bruce, you are probably sitting on the purest stand of yellow Lucerne on the Planet. E.T. Bingham

The Facts: M. falcata is a shy seeding plant. Only 5 kg of seed from 4000sqm was returned, although good insect pollination was available.

The Science: M. falcata benefits are crossed into M. sativa (standard lucerne) to produce a plant of outstanding drought tolerance and persistence.

A note from Niels Ebbesen Hansen, a noted plant collector from early last century: ` Laterals from the main roots often extend for a distance of 1 m.' The laterals (roots) show enlargements where a shoot is sent to the surface, occasionally a small root will break off from the parent plant and remain an independent plant i.e. plant renewal.

These traits are breed into and show in Runner II Lucerne , the only Lucerne on the NZ Market with the M. falcata Gene. Awareness and knowledge of M. falcata date back 120 years, many science papers and on farm accounts are available to read, we have included but a few examples.

Bruce Clark, Kiwi Seed Owner, Blenheim

Pictures: A pure stand of M. falcata growing near Blenheim, NZ for the University of Wisconsin Breeding Program.

Appendix 2

USA Experience

History of Medicago falcata (WISFAL)

WISFAL is a derived tetraploid synthetic of M. falcata that was developed by backcrossing tetraploid 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 Lucerne. 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; Pl 560333). At this time, 10 kg 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 report by Larry Smith). As Smith reports, there is an impressive number of plants after 10 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, eliminate future pasture renovation. What happened on the Smith farm mimics what has been experienced in South Dakota over the past 100 years.

Edwin T. Bingham, Plant Breeder Wisconsin University, USA

Appendix 2

History of WISFAL Medicago falcata

sown at the Larry Smith Farms

The pasture that was selected for M. falcata planting was approximately 1.2 ha. The forage present was a mixture of cocksfoot, bluegrass, couch grass, some white clover and red clover. In the Spring of 1993, the pasture was disked twice, and then planted approximately 9 kg of the WISFAL seed using a Brillon seeder. The goal was to retain as much of the grass as possible. In the late February or early March of 1995 through 2002, approximately 1kg of red clover per hectare was frost seeded on the area.

The area was rotationally grazed during the summers of 1993 through 2002. Beginning in the Autumn of 1995 through the present year, 50 or more lightweight beef calves (150-200 kg) had access to this pasture via a barn and small feeding area adjacent to it, some years hay was fed on the pasture. Each year the animals were left on this pasture until approximately May 10-15. When the animals were removed each spring, it was observed that this small area was extremely overgrazed. During the time from planting through 2002, the plants were never allowed to flower or produce seed.

In the summer 2002, this pasture was not grazed (actually we forgot to open the gate) on the first two rotations. In late July, the owner observed that the hillside was yellow with flowers. Upon closer observation, it was noted that different areas of WISFAL varied from 80% down to a 10% stand. The owner was amazed that any legume could withstand the amount of grazing pressure to which the area had been exposed.

Larry Smith, Viroqua Wisconsin

Appendix 2

Yellow-Blossomed Alfalfa on Rangeland in South Dakota

Norman G. Smith

In the early 1960's, shortly after the release of 'Teton' alfalfa by the South Dakota Agricultural Experiment Station, I attended a crop improvement meeting at Bison, South Dakota. At this meeting, Dr. M.W. Adams presented a history of yellow-blossomed *falcata* alfalfa [*Medicago sativa* subsp. *falcata* (L.) Arcang.] in South Dakota, and read a list of early settlers in Perkins County who had received a small packet of *falcata* seed from Dr. N.E. Hansen. Dr. Hansen was a professor at what is now South Dakota State University at Brookings. The list indicated that my great uncle, Charles Smith, had received a seed packet in 1915. The settlers were instructed to scatter the seed by their back door.

Dr. Hansen made eight trips to Europe and Asia beginning in 1894 to collect plants that would contribute to agriculture in the Northern Great Plains. Most of the *falcata* alfalfa brought to South Dakota by Dr. Hansen originated in Siberia where he found it growing wild on the plains. Since he noticed cattle and sheep were grazing the alfalfa unattended, Dr. Hansen concluded that bloat could not be a major problem.

Charles Smith was elderly in 1915, and his son-in-law, Charles Gehrki, soon took over the operation. Gehrki owned a steam engine and a threshing machine and raised grain crops wherever he could. He also raised sheep, but went broke duirng the drought and grasshopper years in the 1930's and lost the land. Chris Snorteland, a large cattle and sheep rancher, bought the Charles Smith ranch from the county and my wife and I bought it back from the Chris Snorteland estate in 1971. At that time there were some isolated plants and a few small patches of *falcata* alfalfa that had survived and spread from the 1915 planting.

We grazed the alfalfa during the spring and summer for the first few years after purchasing the land. One fall we noticed considerable seed production from 2 or 3 patches. After that we grazed the alfalfa in the spring, fall, and early winter, but kept the cattle off during the summer to allow seed production. In 1995, 350 yearlings were on grass-alfalfa pastures from April 15 to June 1, and our cow herd grazed them from October 20 to January 1. We had no problems with bloat.

Around 1982, we started seeding *falcata* alfalfa in 42-inch rows in plowed ground and interseeding it in 60-inch rows in crested wheatgrass and native pastures. Since then, the *falcata* alfalfa has spread to a solid stand on the plowed land and has spread between the 60-inch interseeded

Falcata *on the Norman Smith ranch, Lodgepole, South Dakota, 1996.*

Appendix 2

Norman Smith and Falcata *alfalfa in bloom on Smith ranch, Lodgepole, South Dakota, 1996.*

rows. The most amazing thing about falcata alfalfa is its ability to reseed and compete with grasses in our semiarid environment (about 15 inches average annual precipitation). I have good stands of *falcata* alfalfa on nearly 200 acres of pasture where it has established completely on its own without interseeding.

I have been interseeding alfalfa into grassland since 1963. A furrow is made using an 8-inch cultivator sweep with a bar welded across the front to keep the sod from falling back into the furrow. This makes a furrow about 8 inches wide and 1 to 2 inches deep. A John Deere No. 71 flexplanter is mounted on a tool bar behind the furrow openers. I have found that the furrows fill in and practically disappear in a few years. A total of about 400 acres, about 150 of which trace back to *falcata* alfalfa from the 1915 planting, have been interseeded. I have also used the cultivars Foster, Teton, and Travois for interseeding, but their long-term survival under grazing is not as good as the yellow-blossomed *falcata* alfalfa.

Falcata alfalfa brought to South Dakota from Siberia by Dr. N.E. Hansen is a unique rangeland plant with much potential. Dr. Hansen's prediction that it would "probably hold its own against any other rangeland plant in the Northern Great Plains" has been proven. Our experience with *falcata* alfalfa on our ranch can be summed up as follows:

Stands have survived for over 80 years under stresses from drought, cold, grasshoppers, grass competition, and sheep and cattle grazing.

It reseeds itself and spreads naturally in rangeland.

It protects itself by going dormant in dry times. It will not produce as much forage as other alfalfas in dry years, but it will regrow and blossom after a late rain.

Regrowth is not as rapid as other alfalfas, but this may be a survival mechanism when grazed.

Seed production is lower than other alfalfas, and hard seed may not germinate the first year after seeding. Hard seed remains viable in the soil over extended periods of drought.

New stands may take up to 4 to 5 years to become fully established in grass-alfalfa pastures.

Falcata alfalfa has fine stems and small leaves compared with other alfalfas. It has high nutritive value, and we have not experienced problems with bloat under our grazing management practices.

Once fully established, *falcata* alfalfa will double or triple forage production of pastures in most years.

My father, Newell B. Smith, filed on the home quarter in 1907. It is located in the northwest part of South Dakota in Perkins County. We are 25 miles northwest of Bison, South Dakota. My wife, Leotta, and I, and my son, Tim, and his wife, Gwynne, own and operate a 500 cow-calf/yearling ranch on 9,000 acres of deeded land. We also have a permit in the Grand River Grazing Association, which is a government pasture. We sell 1/3 of the calves after the first of the year. The remainder we run as yearlings on grass. Most years we send yearlings to a feed lot, but some years we sell them by Sept. 1, depending on the cattle market.

We do not have any *falcata* seed for sale at this time. Grasshoppers destroyed our alfalfa seed crop in 1996. They are also a serious threat in 1997. We are continuing to expand our use of *falcata* in our pastures.

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