

A Single Clover

White flowered *Melilotus alba* Medik was introduced from Europe and Asia in early 1664, and was (and often still is) considered a weed because it occupies neglected fields and roadsides. It is found in all 50 states.

Larry Connor

Last Summer a single white sweet clover plant germinated outside my spare bedroom window. Where and when did the seed arrive? Who knows, but between my receiving gifts of clover seed, a 30-year germination potential and the fickle nature of suburban Michigan, it happened. During one of my rare frenzies of weeding I held the young plant in my hands to pull out by the roots, but my inner beekeeper won out over my active gardener, so I let it grow to see what happens. This Spring it was quick to green up, since it was next to both the foundation of the house and the outside furnace/air conditioner unit, with full South exposure. I can only suspect that it was a perfect place for such a plant, for by June it grew to the top of the roofline. When it started to flower in mid June it attracted a huge number of insect pollinators, from honey bees (of course) to potter's wasps and a full range of solitary bees, many of them quite small in size. Normally the plants grow four to six feet in height.

The plant shaded the bedroom window as well as any shrub, providing diffused light. I gazed at the plant's growth and pollinator activity through the window holding my first cup of coffee on rare quiet mornings at home. In July a significant storm with 75 mph straight-line winds flattened many flowers in my garden, and the clover plant was pushed against the nearby roses. That did not stop the pollinators, as they reached the flowers as well as before.

This single plant has kept my mind working. It is beautiful to watch grow so rapidly and I like the way it screened the window until the storm hit. I enjoy seeing so many insect species visiting its tiny flowers (but not all of us worked on degrees studying insect pollination). It makes me wonder so much: Why are these plants not sold next to the snapdragons and petunias in garden centers? Why doesn't Wal-Mart (and all the other box stores) sell flats of sweet clover plants for gardeners who appreciate bees and other pollinating insects? Why don't beekeepers pass out these seedlings by the tens of thousands at farm markets and urban gardener meetings? How many of these plants would a suburban yard support and provide



an endless amount of fascination and scientific inquiry while fixing nitrogen for the plants nearby? And perhaps just as important, how much honey does one such plant produce over its blooming period?

Technically sweetclover is not a true clover, but a related member of the Leguminaceae family, that huge group of plants with flowers that are often highly attractive to bees due to their large nectar and pollen production. Yellow-flowered *Melilotus officinalis* Lam has a shorter growing period and is a bit more branched than the white species. It is more drought tolerant and is well suited for conditions in North and South Dakota and surrounding states where rainfall is limited. I have been amazed to find it growing out of cracks in the rock along the Salmon River in Idaho, where annual rainfall is less than five inches per year. (The long taproot is clearly how it survives). When the two species grow in the same region, the yellow-flowered sweetcover blooms before the white-flowered plants. With some selection for different varieties within the white sweetclover it is possible to extend the blooming period. Yet I have not found a source for 'mixed' white clover seed containing different varieties.

White flowered *Melilotus alba* Medik was introduced from Europe and Asia in the early 1664, and was (and often still is) considered a weed because it occupies neglected fields and roadsides. It is found in all 50 states. Around 1900 it was discovered for its potential use for hay, pasture and silage, and the popularity of this plant exploded. Beekeepers were able to produce large crops of honey in many parts of the United States where the plants enjoyed a period of extreme popularity with farmers. These may have been some of the largest honey crops ever produced. Those plantings are largely gone, with the fields supporting field corn and soybean production. In the Midwest, it is rare to find a recently abandoned field filled with either white or yellow sweet clover.

As a legume, and when inoculated with the proper bacteria, sweet clover supports nitrogen fixation as the nodules form on the roots. A vigorous two-year planting will produce as much as 100 to 120 pounds of nitrogen per acre. Where sweet clo-

ver is still used by farmers it is often for its value as a nitrogen source. It is also plowed under as a green manure plant. Maybe some of this culture fits into the more organic, local food producers?

Sweet clover responds well to the addition of lime. It does best at a soil pH of 6.5 or higher. It does the best in full sun, and grows in hot and cold climates. Young plants cannot tolerate flooding, but generally grows very well in abandoned fields, pastures and prairie communities.

Sweetclover is an excellent wildlife cover crop, and is grown in game and wildlife conservation areas, often in disturbed soil. Quail, grouse and ring-necked pheasants eat the seed. It provides nesting materials for ducks and a wide range of birds. Small mammals also eat the seed. The growing plants provide forage for deer, elk and antelope, depending the region. So while some clover and hay producers consider white sweet clover an invasive weed and potential seed contaminate, the beekeepers, hunters and wildlife enthusiasts are promoting and planting this exotic import.

How do you grow sweet clover?

Seed is often broadcast at the rate of 10 to 15 pounds per acre into Fall planted small grains in the late Winter before the period of Spring freezing and thawing. The freezing-thawing cycle covers the seeds. It is also drilled into the soil at a depth of a half-inch during late Summer, but this usually yields less than the spring seeded sweetclover due to the exposure of the seedlings to Winter soil heaving and exposure. Once the fall planted small grains are harvested the sweetcover plants are able to grow profusely. They may be used for a hay crop, used for grazing, or left alone – depending on the variety used.

Seed must be scarified since new seed is 50 to 80% hard seed and, alive in a tough seed coat, may not germinate for up to 20 years! Seed producers scratch the surface of the clover seed so moisture can reach the plant embryo inside.

The smell of fresh-cut hay

Perhaps you grew up on a farm, or you have spent time on a farm, and you know the sweet smell of newly cut hay is amazing. There is a source of the sweet odor of freshly mowed hay, and one of the key components is a compound called coumarin (not to be confused with coumadin). This is a sweet-smelling plant substance, a benzopyrone that is in sweet clover. Used in perfumes, and the source of the *sweet* part of the name. Once used as a tobacco and drink flavoring, it has been found to have a toxic effect to on the livers. There is an initial aversion, since high levels of coumarin are produced by plants to discourage feeding upon by animals. Once they have fed on the plant, they continue, adjusting to the taste.

Coumarin has no anti-coagulant properties, but a number of naturally occurring fungi transform the molecule into dicoumarol, and is the cause of "sweet clover disease" in cattle after feeding on moldy sweet clover silage. Pharmacists have taken coumarin and used it to produce dicoumarol, especially warfarin (Coumadin) for use both as a blood thinner and as a potent rodenticide by causing the animal to bleed to death.

Plant breeders have selected strains of sweetclover that posses a lower coumarin concentrations. The yellow-blossomed Norgold was released by Agriculture Canada as a low-coumarin variety, and is recommended for animal feed. The white-flowered equivalent is Polara, released by Agricultural Canada in 1970.

Annual sweet clover

Most of the sweet clovers, both yellow and white, are biennial, growing only leaves the first season and then flowering the second season, after which they die. There was early interest in the development of a single season, or annual sweet clover, called Evergreen. The Ohio Ag Experiment Station produced it in 1935. Seed may be hard to find, but it was popular with some beekeepers due to its later and prolonged blooming period.



A few thoughts about my one plant

I crawled into the tangled mass of sweetclover and roses and made these very non-scientific observations:

The plant consisted of 25 separate stems coming out of the ground. I interpret the significant growth rate as the advantage of the plant taking two years to develop over one – it can produce more floral structure and more seeds.

Each stem had about 15 side stems plus a terminal area. The side stems almost all had three flower spikes, and there were about 10 flower spikes at the tip of each stem not growing on a side stem. That is 55 flower spikes per stem. If there are 25 separate stems, this yields 25 x 55 or about 1375 flower stems on this plant. Note: The flower development of this plant was determinate – meaning that only a set number of flower spikes were produced on each plant. With more rainfall, I doubt more flowers would develop, certainly not that the terminal growth points of the plants. If grazed upon or cut by a farmer it would produce new growth if done before seed has occurred. My plant produced flowers and bee food for about four weeks, but the weather was hot, and pollinator activity strong. If the bees and other insects cannot visit the flowers, they hold on until the weather improves. This has save many honey crops for commercial beekeepers after a cold early Summer.

Seed and flower counts on each flower stem ranged from 45 to 85 individual florets or seeds, taking a midpoint of 65 potential seeds per spike, that gives us (1375 x 65) or just under 90,000 seeds from this one plant. One reference (see below) stated that there are about 260,000 seeds in a pound of sweetclover seed. That means that my plant produced about a quarter pound of seed, making me think I should harvest it.

Clearly a more detailed set of observations is needed, and I suggest that my plant is at the far high extreme of average.

Why promote sweet clover?

1. It is an excellent nectar source, and when someone asks, "what can I do to help the bees?" tell them to plant sweetcover or another appropriate clover for their location. Of course

we want our honey bees to visit sweet clover, but the plant is very useful to a wide range of pollinating, nectar-feeding insects, including butterflies and solitary bees. Remember, sweet clover grows in all 50 U.S. States and much seed is produced in Canada.

2. It is good forage for animals, including cattle, goats, horses, rabbits and sheep, providing them with about 10% digestible protein. Wild deer, antelope, elk and mule deer graze on the plants enthusiastically.

3. Birds of many feathers use the plants for food and nesting materials. It is a good blind for birds to hide.

4. The plants develop deep taproots and can survive in very marginal areas, including old gravel pits and areas where coal has been strip-mined. Like other Legumes, the sweet clover helps fix nitrogen and thus improve the soil. The plants may also be used as a green manure plant. The long taproots penetrate the subsoil and increase soil aeration and water adsorption.

5. Because of the coumarin, the plants do not taste very good to many plant feeders. When used as forage, there is not risk to grazing animals, but when exposed to certain molds in silage it can be fatal to cattle.

So leave it in the natural state. Use of the low-coumarin varieties like Norgold and Polara reduce the risk to animals.

There is a lot of confusion in the minds of beekeepers about sweet clover. I used two references that I recommend. They both provide clear detail about culture of the plants as well as lots of additional information of potential use to your farmer and small-plot gardeners. **BC**

1. YELLOW SWEET CLOVER & WHITE SWEET CLOVER *Melilotus officinalis* (L.) Lam. & M. alba Medik, United States Department of Agriculture, Natural Resources Conservation Service Plant Guide http://plants.usda.gov/plantguide/pdf/pg_meof.pdf
2. Dwain Meyer, Sweetclover Production and Management, R-862 (Revised) September 2005, North Dakota State University Extension Service. <http://www.ag.ndsu.edu/pubs/plantsci/hay/r862w.htm>

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