GROWING
SWEETCLOVER
IN TEXAS
Acknowledgment

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GROWING SWEETCLOVER IN TEXAS

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The greatest value of sweetclover is for pasture and soil improvement. Sweetclover is widely adapted and, like other legumes, it utilizes nitrogen from the air. A good crop of sweetclover may add many pounds of nitrogen to the soil and improve the tilth, aeration and rate of water intake.

SPECIES AND VARIETIES

The annual white-flowered sweetclover, Melilotus alba annua, is the type most common in Texas. Only two varieties, Hubam and Floranna, are planted, and over 95 percent of the acreage of annual white-flowered sweetclover is in Hubam. Many Texas seed growers produce Hubam seed, and large quantities are sold out-of-state. Hubam is grown on a large acreage throughout the Texas blacklands. It fits into the cropping system of this area better than the biennials because cotton root rot and late summer drouths limit the areas where biennials can be grown. Although subject to cotton root rot, Hubam usually matures before the organism causing the disease can injure the plants seriously. If used as a green manure crop, it may aid in controlling cotton root rot. However, some experimental tests show conflicting results.

Floranna produces about the same yields per acre as Hubam. It is superior to Hubam from the Port Lavaca area south since it furnishes earlier grazing and matures 1 month earlier. Its early growth habit makes it valuable for use in wind strips in the blow sand area of South Texas. In North Texas it matures at approximately the same time as Hubam and neither the seed nor the plants can be distinguished. Certified seed of Floranna should be purchased when possible.

Annual yellow-flowered sweetclover, Melilotus indica, often called sour clover, seldom reaches a height of 3 feet while Hubam often is 6 feet tall. Melilotus indica matures very early, but the forage is not palatable to livestock and this clover should not be used for grazing or hay. Floranna eventually may replace it in much of South Texas. Melilotus indica has a weak root system and produces less top growth than other adapted sweetclover varieties. It often grows along the roadsides in Area 3, shown on the map below.

Biennial white-flowered sweetclover, Melilotus alba, is not as popular in Texas as the biennial yellow-flowered types. Two varieties, Evergreen and Spanish, are grown but neither is seeded on a large acreage. Common white also is planted on a small acreage. Evergreen would be an especially desirable variety if the

Areas of adaptation of sweetclover in Texas. Area 1, not generally recommended; Area 2, biennial white, biennial yellow, annual white (Hubam); Area 2-N, spring planted; Area 2-S, full planted; Area 3, annual white, annual yellow; Area 4, not recommended except under irrigation.
seed were not so difficult and expensive to harvest and if it were more disease resistant. It begins blooming at the base of the plant, and 6 to 8 weeks may elapse before the top has finished blooming. Evergreen is highly susceptible to southern anthracnose.

Biennial yellow-flowered sweetclover, **Melilotus officinalis**, is the most popular biennial type in the State. Madrid is the only variety grown on a large acreage, but seed of common yellow sweetclover occasionally are planted. Madrid was tested in 1927 at the Denton Experiment Station where recommendations for its general use first originated. It rarely exceeds 4 or 5 feet in height while the biennial white-flowered types may reach a height of 8 feet. Madrid produces a better forage than the white-flowered species because it is leafier and has finer stems. It produces a high yield of forage, and its seedling vigor gives it a competitive advantage over other vegetation. Since the seed mature fairly uniformly over the plant, they can be harvested mechanically.

WHERE SWEETCLOVER GROWS

Sweetclover has been tested widely under many environmental conditions in Texas. It is not generally recommended in the sandier soils of Area 1. (See map, page 3.) Sweetclover thrives best in well-drained soils high in lime, phosphorus and potash. Hubam and the biennial varieties are well adapted to Area 2. The tight, hard soils in the western part of Area 2 are usually too drouthy for sweetclover. In areas where water becomes a limiting factor, sweetclover should be planted in 36 to 42-inch rows and cultivated. Large acreages of **Melilotus indica** and Hubam are grown in Area 3. Poor drainage often limits the growth of sweetclover in the eastern half of Area 3, and drouth has the same effect in the western half. **Melilotus indica** grows better than other varieties of sweetclover in acid soils where no lime is applied. Poorly drained soils, drouth and diseases seriously limit the use of biennials in Area 3. Sweetclover is not generally recommended in Area 4. Moisture is the limiting factor in its growth in this area.

**CULTURAL PRACTICES**

Sweetclover often is planted in combination with another crop. The object of this two-crop system is to obtain an extra crop from the land and to keep down weeds in the young sweetclover.

**Inoculation**

A strain of bacteria lives on the roots of legumes in clumps (nodules), and these bacteria take nitrogen out of the air and fix it in the
Sweetclover requires a different strain of bacteria than legumes such as vetch or peas. If only small quantities of bacteria are present, very little nitrogen is fixed. Sweetclover occasionally makes more growth the second time it is planted in a field than the first since larger quantities of the nodulating bacteria are available. Sweetclover seed should be inoculated prior to planting unless it or alfalfa was grown on the land during recent years. Commercial inoculants are available from most seed companies and are highly effective, easy to use and relatively inexpensive. Directions for using the inoculant are on the containers.

**Planting Dates**

Biennial varieties may be planted in August and September under irrigation on the High Plains. Otherwise, sweetclover should be spring-planted in late February or early March in Area 2N, fall or spring-planted in Area 2S and fall-planted in Area 3. In these areas it often is planted with oats for grazing. The oats make good grazing until late spring, when the clover is ready to supply grazing. The practice of planting sweetclover with small grains for grazing is not too successful in rainfall areas of 30 inches or less.

**Seeding Rates**

The seeding rate depends upon factors such as germination of the seed, climate, companion crops, row width desired and the use to be made of the clover. Clover seed may be hulled, unhulled or scarified. It is important that scarified seed be planted if a good stand is desired immediately after planting. However, nonscarified seed come up over a long period of time, and less risk from unfavorable weather is involved when they are used. In general, the following seeding rates of high-quality seed are recommended per acre, but these rates should be increased under especially favorable environments and decreased in the drouthy regions:

- Rows 36 to 42 inches wide—2 to 3 pounds
- Rows 14 to 16 inches wide—4 to 5 pounds
- Overseeding on small grains—8 to 10 pounds
- Drilling alone—12 to 15 pounds

**Preparing sweetclover land for planting a spring-planted crop. One tractor is shredding clover, another bedding the land and still another is rebedding it.**

**Method of Planting**

Sweetclover seed should be planted approximately ½ inch deep on a firm seedbed. When planted with small grains, a drill with a small-seed attachment is desirable. The downspouts from the small-seed box may be attached to the rear of the disc boot and the seed allowed to fall behind the disc and then covered with a chain drag or press wheel. Many farmers plant small grain with a drill and then overplant with the same drill. Once sweetclover has produced seed, volunteer stands may come up for several years.

**Fertilizer**

Since sweetclover grows under a wide range of soil and climatic conditions, the soils vary widely in their need for fertilizer, even on the same farm. Maximum yields cannot be obtained unless fertilizer is used in combination with good management practices. Sweetclover has a high requirement for both calcium (lime) and phosphorus. It cannot be grown successfully on soils which remain strongly acid or deficient in either of these minerals. Soil tests should be made before planting sweetclover. Your county agent can tell you how to obtain a soil test. When sweetclover is planted on soils high in calcium (such as the Blacklands of Central Texas), it is important to place the superphosphate in bands rather than broadcast. These bands of fertilizer should be approximately 2 inches below the seed.
Rear view of grain drill for planting oats and sweetclover in one operation. The sweetclover seed fall behind the opening disc and are covered shallower than the oats.

Weed Control

Occasionally it may be necessary to use herbicides to control weeds in sweetclover. Sweetclover is susceptible to most herbicides and serious injury may result from over-treatment. Amine salts of MCPA and DNBP are less likely to injure sweetclover than 2,4-D. MCPA or 2,4-D at 1/8 to 1/4 pound in 5 to 20 gallons of water per acre, or DNBP at 3/4 to 1 pound in 30 to 50 gallons of water per acre will control most broad-leaved weeds in sweetclover. These chemicals should be applied only when the weeds are in the seedling stage. Herbicides should be used only when the weed infestation is serious enough to result in a reduction of sweetclover stands.

USES OF SWEETCLOVER

Hay

Sweetclover hay is high in protein and often is more difficult to cure than most grass hays. If the hay is cut too early in the season, the moisture content may be so high that it will be difficult to cure properly. Improperly cured sweetclover hay may mold and contain dicoumarin which reduces the clotting power of the blood. Cattle fed this type of hay sometimes bleed to death from slight wounds or internal hemorrhages. Dicoumarin is not evident by visual examination of the hay. Cattle should not be fed large quantities of sweetclover hay just before dehorning, calving or a short time after calving.

Sweetclover should be harvested for hay when the first blooms appear. The plant may become coarse and stemmy if harvesting is delayed until full bloom.

Hay from biennial sweetclover is usually of higher quality the first year than the second. The plants are larger the second year, with a larger proportion of coarse stems and a smaller proportion of leaves. Fall-planted biennials may be harvested more than once in a season, but they usually are grazed until early spring and a hay crop is harvested in June when weather conditions permit. Spring-seeded biennials should be harvested in late summer or early fall after the plants have had an opportunity to build up root reserves. It occasionally is possible to obtain two cuttings of hay from second-year clover or one cutting for hay and then a seed crop.

Pastures

Sweetclover furnishes good grazing in those areas where it is adapted. It is often planted for this purpose with small grains. Livestock graze the small grain until late spring when it ceases to grow rapidly, and then the clover usually furnishes excellent grazing. In the Texas Blacklands, small-grain varieties ordinarily cease to produce much forage after May 1 to May 15, while Hubam may continue to produce for another 6 or 8 weeks. Sweetclover and small grain sown in Johnsongrass fields can produce excellent grazing. Biennial varieties are used with cool-season perennial grasses as an irrigated pasture mixture for the High Plains.
A sweetclover field which has been windrowed and is being harvested with a combine which has a pickup attachment.

Cattle do not graze sweetclover readily until they are accustomed to its rather bitter taste. Young sweetclover plants are high in moisture and protein. Mature cows usually do better on sweetclover than younger stock. Sweetclover alone is not highly desirable for grazing since cattle need nonlegume hay or some other form of dry matter to utilize it efficiently. Sweetclover will furnish more grazing if the plants are maintained at a height of 8 to 12 inches.

Silage

Sweetclover silage is equivalent to other legume silage if the plants are harvested when the first blooms appear. Spring growth of sweetclover may be used more efficiently as silage than as hay because it often is difficult to cure hay in the spring. Since prebloom sweetclover has a high moisture content, the crop should be allowed to wilt slightly before ensiling. However, it should not become dry or the forage will be spongy, difficult to pack and perhaps spoil. When sweetclover alone is to be used for silage without wilting, 80 to 100 pounds of molasses or 150 to 200 pounds of ground corn or 8 to 10 pounds of sodium metabisulfite should be added for each ton of green material. If oats or barley are growing with the sweetclover, the mixture should be cut when the grain is in the dough stage and in most cases neither preservative nor wilting is necessary. Because of the possibility of dicoumarin being formed, sweetclover should be packed firmly to avoid molding as it goes into the silo.

Seed

Yields of seed are seldom below 125 pounds per acre and often may be as high as 600 pounds. There are approximately 260,000 seed per pound. Sweetclover seed mature over a period of 2 weeks or more. Harvesting should take place at the stage of maturity when a maximum yield of high-quality seed can be obtained. Sweetclover is either windrowed and then combined or combined direct. Less shattering takes place if windrowing is done when the atmospheric humidity is high. The humidity is highest at night or near sunrise and lowest in the afternoons. Windrowing is most successful prior to 9 A.M., especially after heavy dews. Plants usually are cut for windrowing when approximately 60 percent of the seed have turned black or brown. Clover combines best following 4 or 5 days of sunny weather. Combining direct is rather difficult since many of the seed will be green or immature. If the seed are left until they are fully mature, there is a loss from shattering. Seed combined direct usually should be spread on a wooden floor to a depth of 4 to 6 inches, and it may be necessary to stir them at 3 to 4-hour intervals until no moisture or heat is evident.

Sweetclover is fairly easy to combine if it is windrowed. The stalks usually are cut high and the swath stays on top of the stalks. Some combine operators use a pickup attachment on the combine while others run the cutter bar below the windrow and pick up seed in this manner. It is not necessary to set the combine to turn out only cleaned or hulled seed. The cylinder speed should be approximately 1,600 r.p.m., which is slightly faster than usual for combining grain. The cylinder and concaves should be approximately 1/4 to 1/8 inch apart. It may be necessary to change the sieves and those recommended by the manufacturer should be used. It is important that every combine operator have a speed indicator. The correct speeds of the combine cylinder shaft, sieve and straw walkers are indicated in the instruction manual, and its recommendations for sweetclover should be followed.
<table>
<thead>
<tr>
<th>COMBINE TROUBLE CHART</th>
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<tbody>
<tr>
<td><strong>1. UNTHRESHED HEADS IN STRAW</strong></td>
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<tr>
<td>a. Cylinder speed too low</td>
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<tr>
<td>b. Too much clearance between concaves and cylinder</td>
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<tr>
<td>c. Insufficient concaves</td>
</tr>
<tr>
<td>d. Seed too high in moisture</td>
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<tr>
<td>e. Too rapid feeding resulting from a high rate of travel</td>
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| **2. THRESHED SEED IN STRAW CARRIED OVER THE REAR OF STRAW RACK** |
| a. Rack speed too low or too high |
| b. Material chopped up too finely by cylinder |
| c. Openings in straw rack partially clogged with green material |
| d. Too rapid feeding resulting in a high rate of travel, thus overloading the rack |

| **3. THRESHED SEED IN CHAFF CARRIED OVER THE REAR OF THE TOP SIEVE** |
| a. Improper amount or direction of wind blast |
| b. Material chopped up too finely by cylinder, overloading sieves |
| c. Openings of sieves plugged up with green material |
| d. Sieves not opened enough |
| e. Rear of sieves to low |
| f. Too much threshed seed in tailings |

| **4. POOR CLEANING** |
| a. Sieve openings too large |
| b. Sieves overloaded |
| (1) Feed too heavy |
| (2) Speed too low |
| (3) Straw chopped too fine |
| c. Wind insufficient or improperly directed |
| d. Weeds |
| e. Elevators clogged |

| **5. CRACKED SEED** |
| a. Cylinder speed too high |
| b. Threshed seed returned in tailings |
| c. Insufficient concaves and cylinder clearance |
| d. Concave or cylinder teeth bent out of alignment |

If clover seed go through a processing plant, they usually are cleaned with some type of screen-air machine and then run over a scarifier. The scarification process decreases the percentage of hard seed. Seed handled in this manner should have approximately 80 percent germination.

Annual yellow-flowered sweetclover *Melilotus indica*, is harvested in essentially the same manner as other clovers. However, there is less loss from direct combining. The clearance between the cylinder and concaves may not need to be as large, and the cylinder speed is usually slower. Oats and annual yellow-flowered sweetclover often are grown in a mixture and the sweetclover seed harvested at the same time as the oats. A cleaner will separate the clover seed from the oats.

Volunteer Hubam plants in small grain fields usually mature after the small grain has...
In a Cropping System

Experiment Stations have demonstrated for the past century that sweetclover in a rotation may increase the yields of the crop that follows. The tilth of the soil is improved and the soil is considerably easier to cultivate. The taproot system of sweetclover, especially the biennial species, penetrates the soil to a great depth. Therefore, sweetclover usually improves the aeration and drainage and also the soil’s ability to absorb and hold moisture. It fixes nitrogen in the plants which eventually may become available in the soil, but the amount is variable and difficult to measure. The tops contain $2\frac{1}{2}$ to 3 percent nitrogen. Sweetclover does not add any more organic matter to the soil than a nonleguminous crop of the same tonnage. However, its extensive root system may leave part of the organic matter in a more desirable location than nonleguminous crops such as oats or corn.

Where they are adapted, the biennial sweetclover varieties often produce greater yields of forage the first year than Hubam unless cotton root rot reduces the stand. In addition, they produce approximately 300 percent more roots than Hubam even in the first year. However, Hubam makes a quicker growth than the biennials.

Since World War II, high-analysis nitrogen fertilizer has become more readily available to farmers. Many now prefer to use nitrogen fertilizer rather than turning under a crop of sweetclover. In most areas growers debate

![A crop rotation including sweetclover.](image)

Experimental tests indicate that seed yields of some varieties may be increased as much as 500 percent if adequate pollinating insects are present. The biennial species are more likely to have poor seed set than is Hubam. *Melilotus indica* is self-fertile and produces a full crop of seed without the aid of pollinating insects. The honeybee is regarded as the most valuable of the pollinating insects. One hive or more of honeybees per acre often is desirable. Cloudy, wet and muggy weather for prolonged periods at flowering time may reduce the activity of bees and cut down the amount of seed produced. Sweetclover produces large quantities of nectar which bees can gather easily. It is the best honey plant in Texas.

During recent years many farmers have applied desiccants by plane immediately prior to seed harvest. Desiccants dry the plants and seed rapidly and allow direct combining. The most commonly used desiccant consists of 1 to 3 pints of dinitro in 10 to 15 gallons of diesel fuel per acre. This should be applied when approximately half of the seed pods are brown. Combining should begin 4 to 5 days after spraying to avoid shattering. Shattering may be severe within 8 to 10 days after an application.

Comparative root growth of an annual (Hubam) and biennial (Madrid) variety.

been combined. The plants are small and often are combined direct. Yields of 100 to 150 pounds per acre may be obtained under these conditions. These fields usually are harvested when 90 percent of the seed turn brown or black.
whether it is economically feasible for farmers to grow sweetclover as a soil-improving crop and not harvest seed or graze the plants for forage.

**DISEASES AND INSECTS**

Cotton root rot probably causes more damage to sweetclover than any other disease. Hubam and Floranna usually mature before root rot is much of a problem, but it often seriously reduces the stand of biennial plants. Biennial varieties are used as annuals in the southern Blacklands because of root rot. There is no known method of controlling the disease in sweetclover.

The insects which attack sweetclover are the lygus bug, stink bug, cutworm, grasshopper, webworm and green cloverworm. The insects which most frequently damage sweetclover are lygus bugs and grasshoppers. Frequent checks should be made in clover fields to determine the degree of infestation.


In some years, biennial sweetclover may become infested with an insect known as the sweetclover root borer. The biennial sweetclover acreage has been reduced considerably since 1950 when this insect was first discovered. Infested plants wilt and die during the late summer and early fall of their first year of growth. The above ground symptoms are similar to those caused by cotton root rot. However, numerous small holes and small white worms may be found in the roots if the sweetclover root borer is present. No control measures for this insect are known.
Additional Information on Sweetclover

Agricultural Extension Service

B-226  Wheat—A Major Cash Crop in Texas
B-819  Irrigated Pastures for South Texas
C-297  Liming Soils in Texas
L-161  Seasonal Pastures for Year-round Grazing in the Blackland and Grand Prairie Regions
L-164  Soil Reaction Preference of Some Plants
L-225  Fertilizer Recommendations for the Blackland Prairie, Grand Prairie and Eastern Part of Edwards Plateau
L-258  Winter Temporary Pastures

Agricultural Experiment Station

B-781  Summary of Soil and Water Conservation Research from the Blacklands Experiment Station, Temple, Texas, 1942-53
B-791  Sweetclover in Texas
MP-90  Soil Conservation Management System for Beef Production in the Blacklands of Texas
PR-1439  Effects of Legume Management and Nitrogen on Corn Yields at Denton
PR-1458  Importance of Bees in Sweetclover Seed Production
PR-1559  Pollination of Hubam Clover by Honeybees
PR-1588  Crop Rotation and Cotton Root Rot Control Studies at the Blackland Experiment Station, 1948-52
PR-1593  Dairymen Use Clover to Cut Production Costs
PR-1693  Grazing and Feeding Trials, Blackland Experiment Station, 1952-53
PR-1769  Fundamentals of Growth and Management of Soil-improving Legumes
PR-1794  Effects of Fertilizer and Row Systems on Corn Yields in Different Cropping Systems at Temple, 1953-54
YOUR COUNTY EXTENSION AGENTS? If not, drop by to see them soon. They represent both the United States Department of Agriculture and The Texas A. & M. College System in your county and they can furnish the latest information on farming, ranching and homemaking.

Most county extension agents have their offices in the county courthouse or agriculture building. Get to know them and take advantage of their services.

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