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The Growing and Utilization of Sweet Clover in Kentucky

BY

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THE GROWING AND UTILIZATION OF SWEET CLOVER IN KENTUCKY

By GEORGE ROBERTS, Agronomist

Sweet clover (*Melilotus alba,* or white sweet clover) has come to be recognized as one of the most valuable of the leguminous crops for soil improvement, where conditions are favorable for its growth, and perhaps the most valuable crop on badly worn soils. This is because it makes a very heavy growth upon almost any kind of land, provided only that the soil contains limestone, either naturally or applied.

Sweet clover is known by a number of names, such as melilotus, melilot, bee clover, honey clover, and Bokhara clover. It is a biennial plant, and must, therefore, be reseeded every two years or allowed to reseed itself, if it is desired to have it occupy land continuously. If sown in the winter or spring, it makes a growth of two to four feet the first season, and, in Kentucky, frequently a few of the plants will bloom the first season, altho the larger part of it does not produce seed until the second season. Growth begins very early the second season and is very rapid. The plants reach a height of 6 to 12 feet. The roots are very large and fleshy, decay readily, and are easily cut with the plow. When it is desired to rid a piece of ground of sweet clover, it is necessary only to prevent the clover from going to seed, as all plants die at the end of the second season.

A closely related species that finds favor with some farmers is the yellow sweet clover (*Melilotus officinalis*). It does not grow as large and is not as leafy as the white species, but it is about two weeks earlier. Some farmers prefer it for hay on account of its smaller stems.

A species to be avoided in Kentucky is *Melilotus indica,* an annual plant with yellow bloom, which makes a comparatively small growth.

Soil Requirements

Sweet clover will grow on any type of soil in Kentucky provided it contains carbonate of lime. Experiments conducted by the Kentucky Experiment Station in Laurel county, on the wet soil of the Devonian area at Berea, and in Muhlenberg, Logan, McCracken and Graves counties all show that very rank sweet clover can be grown on these soils by the use of lime, but that it will not grow without lime. These soils vary from slightly acid to strongly acid. Even on the rich very slightly acid soil of the Experiment Station farm, it made only an indifferent growth without liming, the yields in one experiment being 2,100 lbs. per acre on unlimed land and 5,300 on limed land.

An investigation by the writer of a part of Pendleton county, where so much sweet clover is grown, showed, in all cases investigated, that the crop was a failure, or practically so, where the soil was acid.

It is almost certain that sweet clover will fail on soils that have not been limed, unless they contain fragments of limestone either in or near the surface soil, as is the case in Pendleton and other counties in Northern Kentucky where sweet clover thrives so well. Like all other crops, it will be benefited by the application of phosphates on soils deficient in phosphorus, as is the case with most soils outside of the Bluegrass region and the river alluvium areas.

Seeding

1. *Winter Seeding.* Seeding on bare ground in the winter will give good results. The seeding may be done any time from January to March. It is desirable to seed when the ground is cracked or "honey-combed" by freezing so that when the ground thaws, the seed will be covered. The ground should be fairly clean and smooth for this method. Winter seeding

is especially recommended when unscarified seed is used, in order that the hard coat may have time to soften before time for germination. Good results have been obtained by plowing the ground in the fall, harrowing it down, and seeding as indicated above.

Sweet clover may be sown like any other clover crop on grain during the winter or early spring. But this is desirable only from the standpoint of utilizing the land to get a grain crop which, of course, may be the profitable thing to do.

2. *Spring and Summer Seeding.* Excellent results may be obtained by seeding in April and May, if a good seed bed is prepared. In this case, the soil should be well pulverized and firmed down as hard as possible with the roller. The seed may then be sown with a clover drill, or it may be seeded broadcast and covered lightly with a harrow or drag. Seeding in this way should be done under good moisture conditions. In case of dry weather immediately after seeding, the ground may be rolled, preferably with a corrugated roller or culti-packer.

Sweet clover may be seeded in August, but this is not as desirable as spring seeding, because, thus seeded, it lasts over only one growing season, whereas with spring seeding it lasts over two growing seasons. Unless summer seeded clover makes a good growth, it is apt to freeze out during the winter.

A nurse crop may be used, but the only advantage to the clover is the prevention of washing or keeping down weeds until the clover gets a start. A nurse crop so used may be pastured off, or it may be clipped if the clover shows signs of being injured by it. As stated, a nurse crop is of no direct benefit and in many cases causes a partial or entire failure of the clover in critically dry weather.

It is best to use scarified seed. Because of the scratching of the hard seed coat, germination is much more rapid. Seed that will show a germination by the ordinary tests of only 15 or 20 per cent. in the natural condition, may show almost perfect germination when scarified.

The rate of seeding recommended is about 20 lbs. per acre of unhulled seed, or about 15 lbs. of scarified seed. For

late spring and summer seeding, only scarified seed should be used.

If it is desired that sweet clover shall reseed itself indefinitely, additional seed should be sown the second year so that plants will come to seed every year. When keeping up the stand in this way, care should be exercised not to pasture or cut so closely that not enough plants are left for seed.

Inoculation

Unless absolutely certain that the soil is infected with sweet clover nodule bacteria, the seed or the ground should be inoculated. This may be done by treating the seed with laboratory cultures or by sowing soil infected with sweet clover bacteria at the rate of 200 lbs. or more per acre. Soil from an inoculated alfalfa field may be used as well as that from an inoculated sweet clover field. Nodules on the roots are the evidence of infection. The soil should be harrowed in immediately after it is applied.

Sweet Clover for Pasture

Sweet clover is a very nutritious forage, comparing favorably with alfalfa and red clover. It is often claimed that stock will not eat it. This is sometimes the case when stock is turned on it for the first time, just as horses fed on barley have been known to refuse corn, or cattle to refuse alfalfa hay when it was offered to them for the first time.

Cattle, sheep and hogs can readily be taught to eat it and they will thrive on it, as is shown by the wide use of the crop for pasture in Pendleton county. It should be pastured before it becomes too large, as it becomes woody and develops a bitter taste. As already stated, the second year's growth begins early and is very rapid. It should, therefore, be kept well eaten down to prevent its becoming too coarse and woody.

Bluegrass grows well with sweet clover if the latter is not sown too thick. Where it is reseeding itself in a pasture, the stand is usually not too thick, and bluegrass grows well with it. Sweet clover and orchard-grass also make a good combination for pasture. On wet lands, redtop would no doubt make a

good combination with it. In pasturing cattle and sheep, the same precautions should be used to prevent bloating as in the case of alfalfa and clover, altho it does not seem to produce bloat so readily.

It is estimated that an acre of good sweet clover will furnish pasturage for about 20 hogs.

There are many places in Kentucky where there is rough, rocky limestone land that cannot be cultivated, but which can be used profitably only for pasture. Many of these tracts are now worthless for pasture because they have no pasture grasses upon them. Where there are limestone fragments in or near the surface soil, it may be assumed with safety that sweet clover will do well, if inoculated. As already indicated, other grasses will grow well with sweet clover, once it is well established.

There are also many rough and steep lands outside the limestone areas that would make excellent sweet clover and grass pastures if they were limed. The Experiment Station has made an excellent pasture of sweet clover and orchard-grass on the very thin land of Laurel county. It would without doubt pay to lime such lands, where lime is available. From one to two tons of ground limestone per acre or half this amount of burnt lime should be sufficient on most of these lands.

Sweet Clover for Hay

If sweet clover is cut at the proper stage, it makes a palatable and nutritious hay, comparing favorably with red clover and alfalfa hay in digestible nutrients. Ordinarily it is not cut the first year for hay, altho if it makes a good growth, it may be cut, but it should not be cut very low. The second year's growth should be cut before it begins to branch very much, as it becomes woody very rapidly after this stage. Thick seeding makes a finer-stemmed growth, which is more suitable for hay. The hay is cured and handled in the same manner as clover and alfalfa. The essential requirement in curing hay of any kind is to get rid of the water in the plants by a gradual wilting process instead of a sun-burning process. Therefore the

hay should be gotten into windrows and then into cocks, ricks or the barn just as soon as it is safe to do so. The yield of hay varies with the stand and the fertility of the soil. The Experiment Station has had yields on its various experiment fields ranging from 2,000 lbs. to 7,000 lbs. per acre.

Saving the Seed

If a seed crop is desired, the best way to obtain it is to allow a rather thin stand to go to seed, without pasturing or clipping. Sometimes the crop is pastured or cut for hay before cutting for seed, but it is undoubtedly to the disadvantage of the seed crop to do so. In case of pasturing, the stock should be removed early, and in the case of cutting for hay before cutting for seed, it should be cut early and as high as possible. The growth that bears the seed is the branches left, there being no new shoots from the root.

The time for cutting generally recommended is when about three-fourths of the pods have turned black. In order to prevent, as much as possible, the shattering of the seed, cutting should be done when the plants are damp. The seed should be cured in medium-sized cocks.

Cutting may be done with the mowing machine. The plants should be removed in some way so that the machine will not run over them and shatter out the seed. If the plants are not too large, they may be cut with a binder. An advantage in cutting for hay or pasturing before cutting for seed is that the seed plants are smaller and may be harvested with a binder. Where only a small area is to be harvested, the plants may be cut with a corn knife or brier hook.

After the seed is well cured, it is a very simple and easy matter to thresh out the seed with a flail or stick. This may be done on a tarpaulin spread on the ground at the shock, or on a wagon or sled driven from shock to shock. The seed should then be spread out to dry until all danger of heating has passed. The yield of seed varies from two to eight bushels per acre.

The straw should be spread back on the ground, for it and the leaves shed upon the ground have practically the same value for soil improvement as the whole crop.

It is possible to make the seed crop pay the cost of materials and labor in reclaiming worn land. The experience of the Experiment Station on the Berea experiment field is given to illustrate this point.

A piece of wet, strongly acid land that made only about 20 bushels of corn per acre was limed at the rate of two tons of ground limestone per acre and treated with 300 lbs. of acid phosphate per acre, the cost of these materials at the railroad station being $5.60 under normal conditions. It was seeded at the rate of 15 lbs. per acre, at a cost of $3.00. The crop made 275 lbs. per acre of marketable seed, in the hull, which, at 15 cents per lb., was worth $41.25. A very large crop of straw was returned to the soil, so that practically the full value of the crop for soil improvement was secured. Very little of the phosphorus applied was removed in the seed. Similar results have been obtained on other fields.

Sweet Clover for Bees

Sweet clover furnishes an excellent bee pasture. It is estimated that from 300,000 to 500,000 lbs. of honey are produced annually in Pendleton county, a large part of which is made from sweet clover.

Sweet Clover for Soil Improvement

There is probably no crop equal to sweet clover for soil improvement. It will grow on any character of soil that contains carbonate of lime. It is frequently seen growing on quite swampy land, and on washed lands that are as nearly devoid of humus as soils ever become.

It makes a large growth under favorable conditions. Dr. Hopkins determined the amount of dry matter in the tops and roots of an acre of mature sweet clover, and found 10,367 lbs. in the tops (including fallen leaves and stems from first year's growth) and 2,410 lbs. in the roots to a depth of 20 inches.

He also found that 86 per cent. of the nitrogen was in the tops. Average farm manure is about three-fourths water. This crop of clover contained as much organic matter as about 25 tons of farm manure. Manure contains, on the average, about 10 lbs. of nitrogen per ton, while this crop of sweet clover contained 228 lbs. of nitrogen. This example illustrates well the value of sweet clover for soil improvement. It also illustrates the necessity of turning under the whole crop, if the greatest value for soil improvement is to be obtained. However, if the seed only is removed, its value is only slightly reduced. If the crop is fed as hay and the manure carefully saved and returned, about one-third to one-half of the vegetable matter of the hay, and from two-thirds to three-fourths of the nitrogen are returned. Nearly all of the potassium of the feed is recovered in the manure, if both the liquid and solid excrement is saved.

Manure contains, on the average, about 8 lbs. of potassium per ton. A dressing of 8 tons of manure will return to the soil 64 lbs. of potassium, about the amount contained in 150 lbs. of sulfate of potash, which now sells for about $20 per cwt., and in normal times for about $3.00 per cwt.

A ton of sweet clover hay contains about 20 lbs. of potassium, or about as much as 50 pounds of sulfate of potash. Sweet clover is thus a very cheap source of available potassium, for the reason that it has the ability to obtain potassium from the most worn soils.

What has been said about the utilization of the whole sweet clover crop, or the manure made from it, for soil improvement applies with equal force to other leguminous crops. It is a fallacious idea of many farmers that the mere growing of legumes in a rotation will improve the soil, when neither the crop nor the manure made from it is returned. On very poor soils a legume crop used in this way may result in a temporary improvement, but soils cannot be brought to a high nitrogen and humus content without using the legume crop or the manure made from it, nor can a soil of high nitrogen and humus

content be kept in that condition except by such a utilization of the crop.

The growing of sweet clover is an excellent preparation for alfalfa. The soil requirements for alfalfa are the same as for sweet clover, with the exceptions that alfalfa requires good drainage and humus. Sweet clover is the best crop for adding humus to the soil, and, in addition, the inoculation of sweet clover serves for the alfalfa. The Experiment Station prepared a piece of rather thin land this way on the farm of Lincoln Institute, in Shelby county, and had a most satisfactory crop of alfalfa following the clover, the yield being 7.5 tons per acre for the first four cuttings.