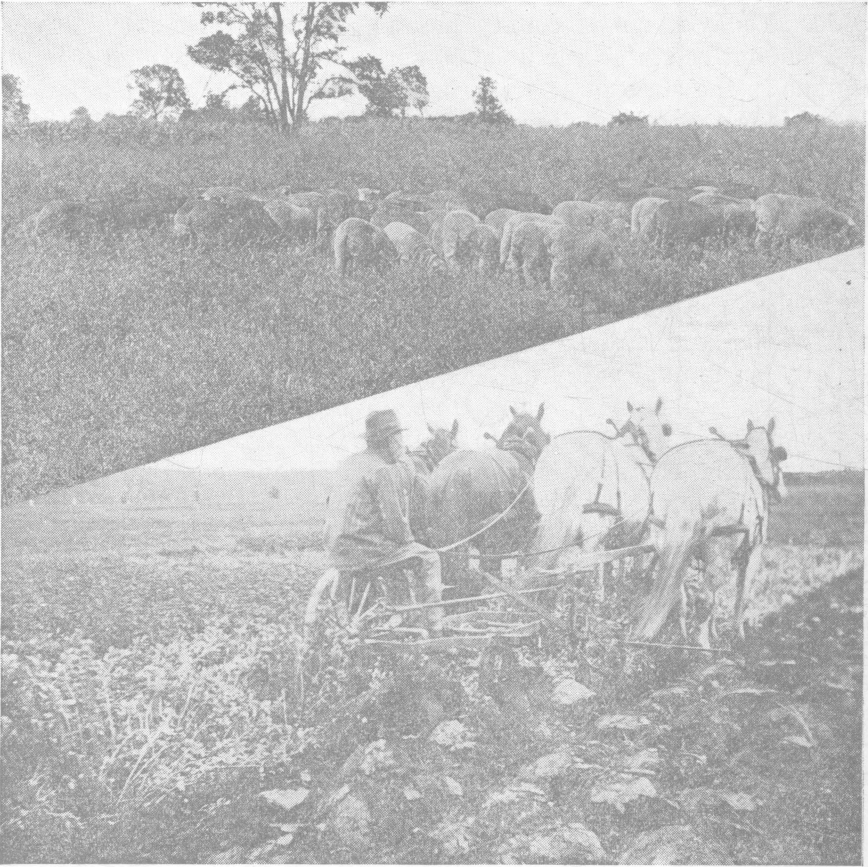


SWEET CLOVER



SWEET CLOVER FEEDS STOCK AND SOIL

By
C. J. WILLARD
Department of Farm Crops, The Ohio State University

THE OHIO STATE UNIVERSITY, COLUMBUS, OHIO, AND THE UNITED STATES DEPARTMENT OF AGRICULTURE, COOPERATING

Agricultural College Extension Service, H. C. Ramsower, Director, Columbus, Ohio.
FREE—Cooperative Agricultural Extension Work—Acts of May 8 and June 30, 1914.

Sweet Clover for Ohio

A crop revolution is quietly occurring in Ohio and other states of the corn belt. Ten years ago one would have travelled far to find a total of 1000 acres of sweet clover sown as a crop in Ohio. Today a single county has 30,000 acres of sweet clover, and the entire state over 300,000 acres. It is already the second legume in the state in acreage, being exceeded only by red clover. Yet this is only the beginning. Sweet clover is destined to become one of the standard farm crops of the state, furnishing rich hay and pasture and making possible the production of larger and larger yields of grain.

Kinds of Sweet Clover

There are four kinds of sweet clover of which seed is obtainable in the seed trade. They are the biennial white, the biennial yellow, the annual white or Hubam, and the annual yellow. The annual yellow has no place in Ohio. When sown in the spring it makes a growth of from 10 to 15 inches, forms seed, and dies by midsummer. The seed is very inexpensive, and has been sold as a substitute for other sweet clovers, though the seeds are easily distinguished.

Hubam Clover.—Much has been heard in recent years concerning annual white sweet clover, or Hubam clover. This has two qualities to recommend it: (1) It will usually produce more hay in the summer and fall after small grain than any other crop that can be sown in small grain. (2) If Hubam is plowed under in the fall of the year it is sown, it does not sprout from the roots and so become a weed the next year. However, the hay is inferior in quality to that produced by the biennial sweet clovers the same year they are seeded, and its root system is so small that its soil-improving value is very slight unless the entire crop is plowed under. Even then it is inferior to the biennial sweet clovers. All things considered, there is little to suggest an extensive use of Hubam in Ohio, though it is a valuable crop in some circumstances.

White or Yellow Biennial?—Of the two biennials, the white is more widely grown, and is the best for general Ohio conditions. When sown in the spring, the white will make decidedly more hay the first fall than the yellow, but the yellow usually produces a greater weight of roots, so the total organic matter produced is

not greatly different. The second year, the yellow has much finer stems than the white, matures from 10 days to 2 weeks earlier, and yields less. The white seems to have a somewhat deeper root system than the yellow. For hay the first year, or pasture the second, sow the white; for hay the second year the yellow may be better because of its finer stems.

For soil improvement, the two are of practically equal value. The yellow seems to be surer to make a stand in dry weather than the white is and may, therefore, be preferable for sowing in corn



FIG. 1. STRAINS OF WHITE SWEET CLOVER, JUNE 6.

Left, early maturing strain in full bloom. Right, ordinary strain, buds just appearing.

or for summer seedings for soil improvement. Likewise, the seed crop of the yellow is easier to harvest.

There are a number of strains of biennial white, some of which differ as widely as do red and mammoth clovers (Fig. 1). The Grundy county and other early maturing strains are similar to the yellow sweet clover in being less desirable for hay the first year or pasture the second.

Much more experimentation by farmers and experiment stations is needed before the better strains of the biennial sweet clovers are developed and made known, but meanwhile one cannot

go wrong in using any one of them. Since the ordinary strain of biennial white sweet clover is responsible for most of the remarkable interest in the crop, it is the only one which will be considered hereafter, though the discussion applies to any of the biennial sorts.

Why Sweet Clover is Valuable

Sweet Clover Grows Anywhere—If Lime is Present.—Sweet clover may be found growing along roadsides, in beach sand, on railroad embankments, along streams, and in washed and gullied fields. This wide distribution in waste places gave the plant its former reputation as a weed. When one attempts to domesticate it, however, he finds one important limitation—the soil must be sweet. While sweet clover will grow sometimes in slightly acid soils, in practice a neutral or basic soil is required for a profitable crop. Even alfalfa is not more particular in this respect. Given this, however, it is tolerant of most other soil conditions. Sweet clover will grow in water-logged soils nearly as well as alsike, and far better than red clover or alfalfa. However, it may winterkill by heaving on such soils, since it is more subject to heaving than either red or alsike clovers. On the other hand, sweet clover is extremely drouth resistant, more so than alfalfa, and as a consequence it furnishes pasturage during summer dry periods when other pasture plants fail.

Sweet Clover Makes Enormous Yields.—Under favorable conditions alfalfa is its only competitor. Not only does it usually make more top growth than red or alsike clover, but it makes more root growth than any other biennial legume. In April, 1923, for example, plots of sweet clover yielded more than twice as many pounds of roots per acre as adjacent red clover plots. This root system is remarkably deep, and the roots are of large size to considerable depth. In July of the second year, roots were found to a depth of 5½ feet in ordinary upland soil on the Ohio State University farm. Even in the fall of the year the sweet clover is seeded, the roots may be 4 feet deep (Fig. 2).

Other Valuable Features.—Sweet clover is markedly disease resistant. Root rot, anthracnose, and similar diseases which have reduced the yield and acreage of red clover in recent years do not affect it. Sweet clover has the same nitrogen fixing bacteria as alfalfa, and so prepares the way for alfalfa by thoroughly inoculating the soil and by improving the drainage as well.

Sweet Clover for Soil Improvement

The Equal of 20 Tons of Farm Manure.—The most important single use for sweet clover is as a soil-improving crop. Many farmers grow it for this purpose only, and all who grow it have in mind its value for this purpose. On soils containing lime or to which lime can be added, sweet clover is so much the best soil builder as to stand alone.

Sweet clover sown in wheat or oats in the spring and plowed under for corn in late April or early May a year later will turn to the soil anywhere from 75 to as much as 250 pounds of nitrogen per acre. It will require 20 tons of ordinary farm manure to add 200 pounds of nitrogen to the soil. How many farmers apply 20 tons of manure to each acre every 4 years? The equivalent of this can easily be secured and a grain crop produced every year by sowing sweet clover in the small grain and plowing it under for corn in the 4-year rotation of corn-oats-corn-wheat.

Feeding Sweet Clover to Corn.—One hundred and fifty pounds of nitrogen are sufficient for the grain and stover of 100 bushels of corn. As an average of 4 years' experiments the least

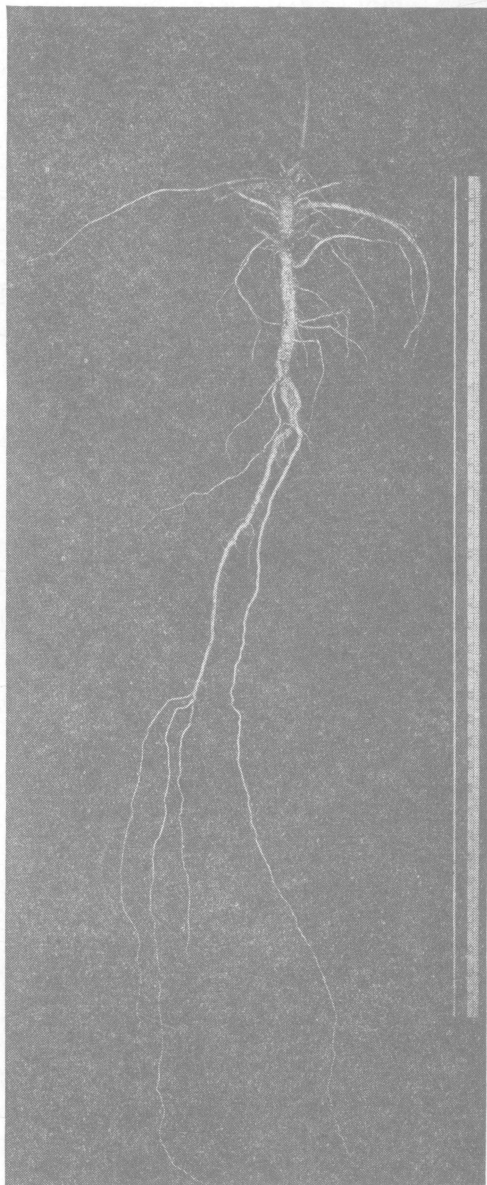


FIG. 2. THE MOST EFFICIENT SUBSOILER
Root of white sweet clover, sown April 20 in oats,
dug in November same year.

amount of nitrogen we have found in sweet clover on upland at the Ohio State University on May 1 is 120 pounds. Compare this with the 4 pounds of nitrogen added to the soil by 200 pounds of 2-12-2 fertilizer! It is no accident that many of our 100-bushel corn club records have been made after sweet clover has been plowed under.

Why buy commercial nitrogen when sweet clover will take it from the air and pay you for doing it? The nitrogen in sweet clover plowed under in this way is available as rapidly as the succeeding crop can use it, since green, succulent sweet clover decomposes in from 21 to 28 days.

Sweet clover also has unusual power to make use of the less available plant foods of the soil, especially phosphorus compounds. These materials are gathered from the deep layers of the soil by the sweet clover roots, and then become available to the next crop when the clover is plowed down.

Renews Tilth and Drainage.—The soil is also greatly improved physically. The land plows more easily after a crop of sweet clover has decayed because of the loosening effect of the organic matter returned. The drainage is tremendously improved. As these large roots decay, open channels for water are left through the hard subsoil, while the structure of the subsoil is improved by the residues added to it. Many farmers have found after growing sweet clover that drain tile which had gradually failed to carry off all the water between the tile because of the increasing compactness of the soil under continued cultivation, now keep all the land free of water.

Rotations for Soil Building.—The most popular and practical way to use sweet clover as a soil builder is as a catch crop in a 2-year rotation of corn-oats or corn-wheat, in which sweet clover is sown in the small grain and plowed down the following spring for corn. This combination can be worked into many practical rotations to serve different purposes. The following 4-year rotations will illustrate:

- (a) Corn, oats (sweet clover), corn, wheat (sweet clover).
- (b) Corn, oats, red clover, wheat (sweet clover).
- (c) Corn, corn, soybeans, wheat (sweet clover).
- (d) Corn, oats (sweet clover), potatoes, wheat (sweet clover).

Many modifications and combinations of these rotations can be worked out. Canning crops particularly have benefited by the sweet clover catch crop.

Plow Under in Spring After Growth is Well Started.—In these rotations the sweet clover can be plowed down in the spring after

from 8 to 15 inches of new growth has been made. (Lower illustration on page 1 shows a field in ideal condition for plowing under. The sweet clover was seeded in wheat the spring previous.) On the contrary, if biennial sweet clover is plowed the fall after seeding or very early in the spring, the big fleshy roots are not killed, and stalks come up in the succeeding crop almost as if the land had not been plowed. This is the only way in which sweet clover is ever a weed in cultivated land, but nearly every farmer who has raised sweet clover has learned by experience how troublesome it can be in this way. However, after growth is once well started in the spring, plowing entirely kills sweet clover.

There is little advantage in waiting for more growth after the sweet clover is large enough so that it will be killed. A considerable part of the top growth is offset by a loss in the amount of roots, while if plowing is delayed too long a dry spell may make it hard to prepare a seedbed for the crop following. In a wet season, sweet clover may be plowed sooner than bare ground because of this drying effect. The roots of sweet clover make it harder to plow at this time than bare land, but it is by no means as hard to plow as alfalfa.

Do Not Leave the Second Year if Grown for Soil Improvement.

—It is worth emphasizing that it is not desirable to let sweet clover stand the second year if soil improvement only is wanted. The plant makes an enormous top growth, so that one is inclined to feel that he must be adding much more fertility to the soil than if plowed under about May 1st. However, as an average of four years we have found four-fifths of the maximum amount of nitrogen for the season present on that date. The better the growth of the preceding season the earlier the maximum nitrogen is reached.

Furthermore, the value of a green manure is somewhat in proportion to the percentage of nitrogen it contains. Sweet clover May 1st contains 3 to 4 percent of nitrogen, while in July it contains only 1.5 to 2 percent. Surely there is no advantage in using an entire crop season to secure a little additional organic matter which will decay and much of the nitrogen be lost by leaching before any crop can use it, when there are so many practical advantages to plowing it in May for corn.

Sweet Clover for Pasture

Sweet clover is rapidly becoming one of the leading pasture plants of the corn belt. The old belief that "stock won't eat it"

has been exploded too often to have weight at this time. When stock that are not used to it are turned into a pasture containing sweet clover and plenty of other feed they do not eat the sweet clover, but if turned into sweet clover alone when in proper condition or into a mixed pasture early, no trouble will be experienced.

Many Virtues as Pasture.—Its carrying capacity is amazing. The difficulty is usually to keep stock enough on it to keep it from getting too coarse. Farmers have estimated the carrying capacity of sweet clover to be from one to four mature animals per acre.



FIG. 3. CONTENTMENT IN SWEET CLOVER.

In general, it will carry double the stock that bluegrass or mixed grass pasture will on the same land. Stock of all kinds thrive on it (Fig. 3).

Sweet clover is very high in mineral content, especially of calcium, and so is particularly valuable for daily cattle and young stock. It never fails to cause an increased milk flow. Opinions differ as to its effect on the flavor of the milk, but many dairymen use it with no complaints. It can be pastured from one to two weeks sooner than other pastures. Bloating is uncommon on sweet clover pasture. There have been a few cases in wet weather, but there is very much less danger than in pasturing any other legume.

Sweet clover is a valuable hog pasture. The first year's growth, especially, is nearly or quite the equal of alfalfa. The second year's growth becomes coarse too rapidly for best results as hog pasture.

Sweet Clover Well Grazed is Best.—Some care is needed to get the greatest use out of the pasture. Stock should be turned on sweet clover early and the pasture should be stocked so that it does not get ahead of the stock, yet not so heavily as to kill it. If it is not kept eaten it will get coarse, bloom, form seed and die in early August, while by keeping it pastured off it may be made to furnish succulent pasture for a much longer period.



FIG. 4. SWEET CLOVER IN A HOCKING COUNTY PASTURE.

A broom sedge pasture treated three years before with two tons limestone, 800 pounds acid phosphate, and a grass mixture including sweet clover.

Sweet Clover in Permanent Pastures.—Since it is only a biennial, sweet clover must be allowed to form seed if it is used in permanent pastures. If not too heavily pastured, seed will form on the lower branches, but seed production may be insured by dividing the pasture in two and allowing the sweet clover to go to seed on half the pasture each year. Sowing sweet clover seed in the early spring with a disc drill or broadcast on honeycombed ground is also a valuable practice in permanent pastures. Sweet clover used in this way has had a remarkable rejuvenating effect

on some of the hill pastures in southeastern Ohio (Fig. 4). However, limestone is absolutely necessary on most of these hill pastures.

Sweet Clover in Rotation Pastures.—The way to secure the most pasture from sweet clover is to pasture it in a regular rotation, for example: Corn, oats, wheat, sweet clover. The second year's growth is pastured from early spring until it dies out in August or early September. By that time the sweet clover in the wheat stubble is ready to furnish pasture for the rest of the season. In this way an all-season supply of feed may be secured.



FIG. 5. ALL READY FOR SPRING.

Crowns of sweet clover sown April 20 in oats, dug early in November. Note the numerous large crown buds, the many nodules on the smaller roots, and the abundant surface branching.

Sweet Clover Hay

First Year Hay the Equal of Alfalfa.—Hay may be cut from sweet clover either the year after it is sown, as with red and alsike clover, or in the fall of the year it is sown. The best hay from sweet clover is secured the year it is sown. The hay is fine, leafy, easily cured, and the equal of any alfalfa in composition, palatability and feeding value. It should ordinarily be cut late in September, and its removal does not seem to injure the stand.

In the late summer, sweet clover forms numerous large buds at the crown (Fig. 5), which will produce the next year's crop.

After these buds are well formed the sweet clover is ready for winter, and the taking off of the season's growth does not kill it. This crop need not be cut higher than other hay crops are cut. On good soils, the yields will average from 1 to 2 tons, with exceptional yields higher (Fig. 6). The 2-year rotations—corn, oats (sweet clover), or corn, wheat (sweet clover)—are thus among the most intensive possible, since they give two grain crops, a hay crop, and a green manure crop large enough to maintain and increase the grain yields, all in two years.

Does Cutting the Fall Hay Crop Reduce the Value of Sweet Clover for Soil Improvement?—Many have asked this question,



FIG. 6. A HENRY COUNTY STUBBLE-FIELD IN SEPTEMBER.

How does this compare with ragweed?

thinking of the loss to the land of the 1 to 2 tons of hay containing 60 to 120 pounds of nitrogen. This loss is of little importance, since it will be largely dissipated by spring, if it is not cut. The real loss lies in the fact that root storage stops as soon as the hay is cut and that when not disturbed, the nitrogen and dry matter stored in the roots usually doubles from October 1 to freezing weather. On rich soils there may be enough root storage by late September so that more is not needed, but the man who wants the maximum soil improving effect from sweet clover will not touch it after small grain harvest.

Second Year's Crop Ill-Suited for Hay.—The second year's growth is hard to use as hay. Sweet clover rapidly becomes coarse and stemmy as it comes into bloom, so to secure good hay it must be cut before the blossoms appear. This is in late May or early June, which is not usually good haying weather. The leaves shatter very easily. The succulent stems may contain as much as 85 percent of water, and so are slow to dry. All things considered, one cannot recommend depending on the second year's growth of sweet clover hay.

However, it is good hay whenever it is possible to get it well cured—equal to alfalfa in every way except that it is coarser. There is no difficulty in getting stock to eat the hay.

Cut High the Second Year.—Furthermore, the plants must be cut high the second year or they will be killed. After the crown buds have started in the spring of the second year, sweet clover never sends out new shoots from the crown as do alfalfa and red clover. The second crop must come from living buds on the stems. No definite height of cutting can be given, but it must be high enough to leave two or three green leaves and branches on the stubble. This will be from 6 to 20 inches high, depending on when the clover is cut and the thickness of the stand (Fig. 7). In a thin stand the plants can be cut lower without being killed than in

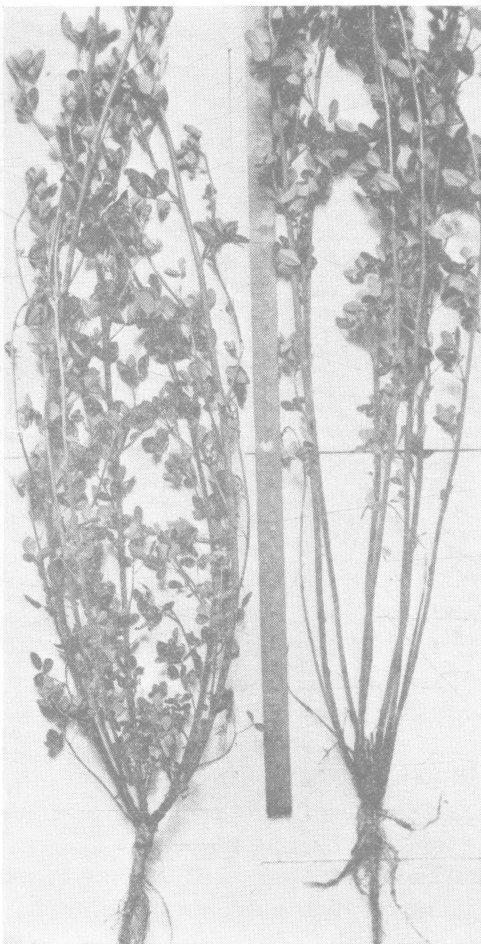


FIG. 7. PLANTS FROM THICK AND THIN STANDS, JUNE 13.

Left, a plant from a thin stand, which would make a second crop if cut 6" high: Right, one from a dense stand, which would be killed if cut less than 18" high.

a thick stand. After the plants are in bloom it is hardly possible to cut them and have a satisfactory second crop. For this reason it is rarely practical under Ohio conditions to get two hay crops or a hay crop and a seed crop the second year.

In order to cut the sweet clover high, some use special shoes of strap iron or 2- by 8-inch lumber under each end of the cutter bar on the mowing machine. Others use the grain binder, setting the bundles in shocks of two or four to cure. Sometimes good hay is produced in this way, but it may mold before it is cured.



FIG. 8. LIMING MADE THE DIFFERENCE.

Miami County. Left, no lime. Right, 2 tons ground limestone. Sweet clover sown over entire field.

Disease from Moldy Sweet Clover Hay.—Experiences in Ontario, Minnesota, North Dakota, and a few in Ohio show beyond any doubt that *some* moldy sweet clover hay will cause a serious disease in cattle. The first symptom is the loss of the clotting power of the blood, so that the animals may bleed to death from minor accidents or operations such as dehorning and castration. Later the animals will develop internal hemorrhages resulting in soft swellings in various parts of the body. By the time this stage is reached the disease is usually fatal. However, if the animal is

not too weak, a cure can be effected by discontinuing the hay and giving good care. Medication is of no value.

The writer has made considerable inquiry without hearing of a case of this disease following the use of first-year hay, though he does not consider it proved that this can never happen. But when this difficulty is added to all the others in using second-year hay, he feels that Ohio agriculture would be better off if no second-year sweet clover were ever used for hay. At the same time, it should be understood that not *all* sweet clover hay, or even all moldy sweet clover hay, causes this trouble. It has never been known to occur on sweet clover pasture.

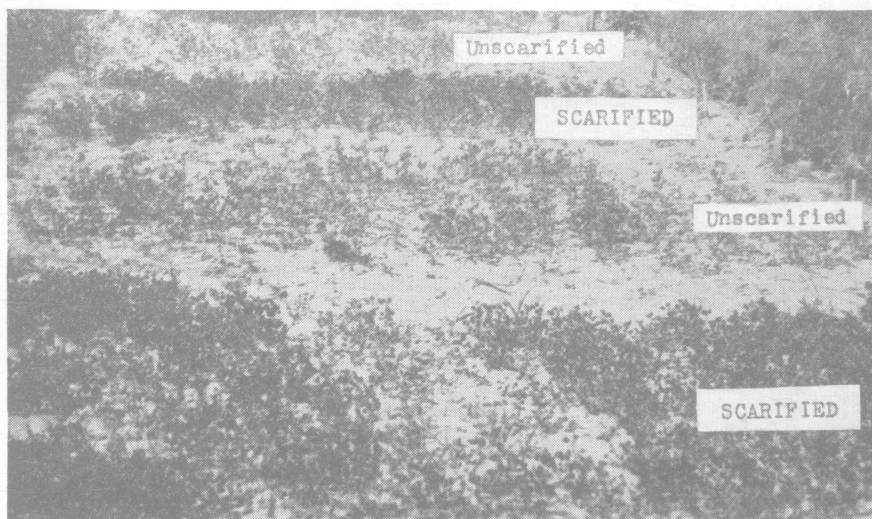


FIG. 9. IT PAYS TO SCARIFY.

Plot in foreground, scarified; next back, unscarified; and so on. Sown April 20 at 10 pounds per acre. Picture taken June 7. All Ohio grown seed. Actual stands, scarified 26 plants per square foot, unscarified 15 plants per square foot.

Requirements for Growing Sweet Clover

Because sweet clover is a common roadside plant, many make the mistake of supposing that it is of the easiest culture. There have been many failures to secure a stand of sweet clover, and there will be unless certain requirements are met. The most important of these are a sweet soil, inoculation, and seed of high germination.

Lime for Sweet Clover.—Before seeding sweet clover the soil should be tested, and, if acid, its lime requirement should be met by applying lime in some form. Usually in western Ohio 1 to 2

tons of ground limestone will be sufficient. It cannot be too strongly emphasized that on hundreds of thousands of acres this is the factor which will mark the difference between success and failure (Fig. 8).

Inoculation.—As with most new legumes, failure to inoculate the soil or seed accounts for many sweet clover failures. Any soil which requires inoculation for alfalfa requires it for sweet clover, since they have the same strain of bacteria. It is not safe to assume that a field is inoculated because sweet clover is growing along the road beside it. It may be, but since failure will result if it is not, and artificial inoculation is simple and cheap, inoculation should always be practiced when seeding sweet clover for the first time on a field. Soil from an established alfalfa field or roadside sweet clover patch is as effective as the commercial cultures.

Sweet Clover Responds to Phosphorus.—To many it will seem absurd to fertilize a crop grown for soil improvement, but there is no more economical way to get the most out of it. On poor soils a liberal application of acid phosphate may double the yield of the sweet clover in addition to increasing the yield of the small grain in which it is sown. Ballou reports a test in southern Ohio in which an application of 200 pounds of acid phosphate increased the yield of sweet clover by three times. Its soil building value was of course multiplied by the same figure.

Seed of High Germination, Scarified, Should be Used.—A very large share of sweet clover seed as usually harvested will not germinate at once when sown. This is due to the presence of from 25 to 90 percent of "hard" seeds. There are seeds which have a waterproof seed coat, and when planted in moist earth they do not take up water and sprout for months or years until the seed coat has decayed or been broken by freezing. A process, known as scarification, has been devised to break this seed coat. It consists of blowing the seed over coarse sandpaper at a very high rate of speed, thereby scratching the seed coat enough to allow water to enter more easily. By this treatment from 80 to 95 percent of sweet clover seed may be made to germinate. Scarified seed, or at least seed of good germination, should always be insisted upon. (Fig. 9).

Seeding Practices

The usual rate of seeding is from 10 to 12 pounds of scarified seed per acre. If it is being grown for seed, considerably less seed may be used. When sown in wheat, sweet clover may be sown in any way that red clover is. Perhaps the best method is to drill the

seed crosswise of the wheat as early as the ground can be worked. If one is using unscarified seed, or unhulled seed from the threshing machine, it is best to sow it before the end of freezing weather, since freezing will cause many of the "hard" seeds to germinate. Some even sow such seed in November or December, but there is nothing to recommend this for Ohio conditions.

When sown with oats it is usually sown from the grass seed attachment on the drill as the oats are sown. The sweet clover frequently grows tall enough so that it is cut with the oats and makes the bundles cure slowly. If the difficulty becomes too pronounced on especially favorable soils, it can be avoided by sowing the sweet clover a week or two after the oats are sown. However, this is not usually necessary and in fact the sweet clover improves the quality of the straw for feed. Someone has aptly said "Sweet clover makes pasture out of stubble and hay out of straw."

Use Nurse Crop for Spring Seeding.—When sowing sweet clover in the spring, some nurse crop should always be used, as sweet clover does not compete strongly with weeds and when sown alone in the spring it is likely to be killed out by weeds. Any of the small grains may be used as nurse crops, and all have given satisfactory results. Perhaps the safest nurse crop for Ohio conditions is an early variety of oats, such as Fulghum or Sixty Day. Barley is equally good where it is grown. Wheat is the most common nurse crop in Ohio, but in nearly every case where wheat and early oats have been compared a better stand has been secured in the oats. Even late oats have been superior to wheat in some cases, though markedly inferior to early oats or barley.

Summer Seedings.—Summer seedings may be made alone or in corn. For seeding alone the seedbed should be firm and moist. It is rarely safe to seed later than August 15. Seeding sweet clover in corn at the last cultivation has about an even chance of success. In a dry season it will not amount to much, but in a wet season remarkable growths are sometimes made (Fig. 10). Yellow sweet clover is probably preferable to white for summer seeding.

Mixtures Containing Sweet Clover.—Often, a mixture will be better than sweet clover alone. On land which is not uniformly alkaline, 4 or 5 pounds of alsike per acre is a most useful addition, and a little timothy is usually added also. These will occupy the spots where the sweet clover fails and are far preferable to the weeds which would otherwise fill these spots. Where it is intended to make hay the second year, alfalfa may be valuable. The first cutting will be very heavy mixed sweet clover and alfalfa. The

sweet clover will be killed and the next two cuttings will be pure alfalfa. In general, however, alfalfa alone is preferable to any sweet clover mixture for hay.

A popular mixture in some sections is 4 pounds each of alfalfa, alsike, timothy, and sweet clover. For seeding permanent pastures sweet clover may be sown with bluegrass, timothy, or brome grass, and as the clover dies out it is followed by a surprising growth of



FIG. 10. A FRANKLIN COUNTY CORNFIELD. OCTOBER 1.

A 1" ear of corn on end in the foreground gives an idea of the height.

the grasses. Four pounds of bluegrass, 6 pounds of timothy, and 8 pounds of sweet clover would be a suitable seeding for most Ohio soils. Timothy should always be sown with sweet clover that is to be pastured through the second year. When the sweet clover dies the timothy, fed by the decaying sweet clover, will make a great fall growth which will add materially to the amount of pasture for the season.

The Seed Crop

A Prolific Seed Producer.—An important advantage of sweet clover is that it produces seed liberally whenever it is grown. The yields of seed range much higher than alfalfa and other clovers if the crop is handled to avoid shattering. The average is from 4 to 6 bushels per acre, and from 10 to 12 or more bushels are not uncommon. For this reason the seed can never be permanently high-priced, and usually it will be, as now, the lowest-priced clover seed on the market. The cost of seeding this crop is lower than for any other legume.

Pasture or Clip the Intended Seed Crop.—Seed is produced in the second year's growth and is usually ready to harvest late in August. The plants are usually from 5 to 8 feet high and hard to harvest. Some secure a less vigorous growth of the seed crop by clipping the early growth, cutting a hay crop or pasturing. Clipping must be done high, early and carefully. Even then it will sometimes injure or kill the stand. Because of this danger, most seed growers simply let the season's growth mature. A grain binder stripped merely to clip the tops and let them fall has been successfully used to clip the seed crop in some sections. Perhaps the safest method of securing a finer stemmed seed crop is to pasture until June 1.

Cut When Two-thirds of the Pods are Brown.—The seed does not ripen all at once. Indeed there are usually ripe seeds and flowers on the same plant. Since the seeds shatter off as they ripen, it is never possible to secure the entire yield. The best time to cut is a matter of nice judgment as to the time one can secure the most ripe seed. The novice is more likely to let it go too long and lose his best seed by shattering than to cut too soon. As near a rule as can be given is to cut when two-thirds of the pods are brown.

Cut With the Grain Binder.—There are two main difficulties in harvesting sweet clover. They are the coarseness of the crop, making it hard to handle, and the ease with which the ripe seed shatters. Probably the best method of harvesting is with the grain binder, cutting on a damp day or early in the morning before the dew is off, in order to avoid shattering. For large acreages it may be necessary to cut at night. This is unusual, but is worth while because the damp plants pack and go through the machine better than in the daytime, and there is almost no shattering. If cut with a binder in daytime it is practically necessary to have sheet iron

pans under the binding head and under the end of the platform to catch the shattered seed.*

Other methods of cutting are with a mower, which shatters most of the seed; with a corn binder, which takes too narrow a swath; and with a self-rake reaper, which is fairly satisfactory but which few people have. None of these methods are as good as the grain binder for Ohio conditions.

The bundles may be shocked in narrow shocks without capping, but usually it is preferable to lay the bundles on the stubble, merely arranging them for easy pitching when they are hauled in (Fig. 11). This causes less shattering of seed from handling and by insects.



FIG. 11. SWEET CLOVER FOR SEED.

Recently, several modifications of old grain binders into combined harvesters and threshers of sweet clover seed have been devised, and are said to do very satisfactory work.

Threshing Sweet Clover.—Sweet clover is best threshed from the field, as it loses seed easily every time it is handled. If the wagons do not have perfectly tight bottoms they should be covered with canvas to catch shattered seed. The grain separator is the most satisfactory machine on which to thresh sweet clover. The clover huller may be used, but the straw is so coarse that the huller does not handle it well. However, the separator will not hull the seed, and the seed in the hull must either be put through a

* See Farmers' Bulletin No. 836, which can be secured from the United States Department of Agriculture, Washington, D. C.

clover huller, or, what is preferable, if one is available, a combination huller and scarifier. This latter machine will hull the seed and can then be used to scarify it for market. Some separators with hulling attachments are on the market which give satisfactory results in threshing sweet clover.

The straw is not very valuable for feed, but is perhaps equal to corn stover. It makes excellent bedding and manure.

Special Uses of Sweet Clover

Sweet Clover Silage.—The difficulty of utilizing the first crop of sweet clover the second year has led to many experiments in using it for silage. As yet this method of utilization is practically unknown on Ohio farms. According to the report of those who have tried it, sweet clover makes better silage than any other legume, as it does not usually become slimy and ill-smelling as do most legume silages.

Sweet clover for silage is harvested with the grain binder and then cut up as is corn. It usually is harvested just after coming into bloom, or earlier, if a second crop is desired. One precaution is necessary. The bundles must be allowed to wilt for a while in the sun before being put in the silo. Sweet clover as cut may contain from 80 to 85 percent of water, while to keep best, the silage should contain only from 60 to 70 percent of water. Unwilted sweet clover put in the silo will drain out considerable juice and the silage will be sour and ill-smelling. The yields will average about 10 tons of silage per acre.

Sweet Clover for Bees.—The oldest use for sweet clover in the United States is as a honey crop. Beekeepers sowed the seed in waste places for years before farmers thought of using it otherwise. Sweet clover will produce more honey than any other crop, and the quality is of the highest. The presence of bees in turn is favorable to large yields of seed. By using four fields, one of yellow sweet clover, one of white, and two of Hubam, one of which is clipped in August, sweet clover flowers for bee pasture could be provided from early June until after frost.

Sweet Clover as a Weed Eradicator.—The dense growth of sweet clover the second year makes it almost impossible for broad-leaved weeds to develop in it. One of the best methods of fighting Canada thistle, bindweed, and similar weeds is to allow sweet clover to grow undisturbed the second year.