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CRIMSON CLOVER

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CRIMSON clover (*Trifolium incarnatum*) is the most important winter annual legume of the central section of the Eastern States. This crop can be grown over a much larger area by using seed of adapted varieties for each section, by using better cultural methods, and by fertilizing the soil (fig. 1).

Figure 1.—Principal crimson clover regions of the United States. The dotted area shows where crimson clover was generally grown before 1938. The cross-hatched area shows where production can be extended by using favorable cultural and fertilizer treatments and adapted varieties.

Besides being an excellent pasture plant and furnishing plenty of hay, it protects the soil during fall, winter, and spring, prevents soil washing, and provides green manure for soil improvement. This legume has the distinct advantage of producing large quantities of seed that can be easily harvested and sown without the use of expensive machinery.

Crimson clover is a native of Europe and is widely grown in France, Hungary, and other central and southern European countries. Seed was introduced into this country as early as 1819, but it was not until 1880 that the plant became important. The acreage has been steadily increasing.

During the 5-year period 1940–45 the annual purchase of seed through markets in the United States has ranged from 6 to 18 million pounds. In 1935 about 2 million pounds were used. In addition, large quantities of home-grown seed are handled from farm to farm.

The common name of this clover is derived from the bright crimson color of the blossoms. Other such common names as German clover and scarlet clover are frequently used. In general the leaves and stems resemble those of red clover, but are distinguished by the rounded tips of the leaves and more hair on both leaves and stems. When crimson clover is planted in fall the leaves develop from the crown and form a rosette, which enlarges whenever weather conditions are favorable. In spring, flower stems develop rapidly and end their growth with long, pointed flower heads. Seed forms and the plant dies with the coming of hot summer weather. The seed is yellow and is about twice as large as red clover seed and more rounded.

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Adaptation

Crimson clover does well in cool, humid weather and is tolerant of winter conditions where the temperature does not become severe or too changeable. It may be planted from midsummer to late fall. In the northern part of the region early seeding and growth are necessary for the seedlings to survive the winter. It will thrive both on sandy and clay soils and is tolerant of ordinary soil acidity. On very poor soils, stands are difficult to obtain and the growth is stunted. The use of phosphate and potash fertilizers and manure on such soils will help to obtain good stands.

Crimson clover may also be grown successfully as a summer annual in northern Maine, Michigan, and Minnesota. Winter culture can be extended into Kentucky, southern Missouri, southern Indiana, and Ohio, provided varieties are grown that are adapted to these sections and the seed is sown in fertile soils early in August.

Seedbed Preparation

The most important and difficult part of producing a large crop is getting a stand. Enough soil moisture to sprout the seed and establish the seedlings is the greatest factor in obtaining a stand. When established, common crimson clover usually produces a good crop.

Seedings may be made alone or combined with winter grains, rye-grass, or grass sod. It is possible also to seed between the rows of cultivated crops, but it is difficult to make an ideal seedbed. Furthermore, the crop plants in the row shade the clover seedlings and use some of the available moisture. If the row crop is planted in wider rows and seeded more thinly, the clover will become better established. When planted between the rows of other crops, the seed is usually broadcast on the surface and covered by cultivating or harrowing. Drilling the seed after the soil surface has been stirred usually gives more complete stands than broadcasting, and it may be done with a small one-horse drill. The seed should not be planted more than one-half to three-fourths of an inch deep, respectively, in clay and sandy soils.

Crimson clover is often seeded following a grain crop. This is a surer method of establishing a stand than planting between the rows of cultivated crops, provided the seedbed is well prepared. After the grain crop is harvested the soil is plowed or disked and allowed to settle. This is followed by light harrowing or disking to kill weed seedlings. Before the clover is seeded the soil should be firmly packed, because a loose cloddy seedbed will not produce good stands. The seed may be either drilled or broadcast, but drilling will give more uniform stands.

Fertilizers

Good stands and growth cannot be expected on very poor soils. Soil conditions can be improved by adding phosphate and potash fertilizers and manure or by turning under such crops as cowpeas, soybeans, or lespedeza. In many soils of low fertility the use of a complete fertilizer will encourage early seedling growth and establishment. On fertile soils crimson clover may be successfully grown without fertilizer, but on most soils applications of 200 to 400 pounds

Figure 2.—Effect of phosphate application on good soil: Treated (left); untreated (right).

per acre of phosphate and 50 to 100 pounds of potash pay in obtaining good stands and vigorous growth (fig. 2).

Frequently a single large application of phosphate and potash fertilizer is sufficient to produce two crops of crimson clover before it becomes necessary to make another application. In some soils the addition of such minor elements as boron may improve growth and increase seed yields. Since the need for minor elements varies from place to place, their use should be based on the recommendations of the agricultural experiment station of the State in which the clover is planted.

Seed Sources and Varieties

Before World War II more than half the crimson clover seed used in the United States was imported, principally from Hungary and France. Since 1938 domestic production has rapidly increased, reaching more than 18 million pounds in 1942. Tennessee produced more than half the home supply. Nearly all the crimson clover may be called common crimson clover, since it does not represent strains or varieties having special characteristics. White-flower strains and several others that differ slightly in maturity have been selected but have not been used.

Dixie Crimson Clover

Dixie crimson clover is a new hard-seeded variety that has given promising results in extensive trials. It is more widely adapted than common crimson clover, as it grows well in the Gulf coast section and appears to be slightly more winter-hardy than common crimson. Dixie has successfully volunteered to good stands when grown in pastures with Bermuda grass, with small grains for grazing, and in rotation with such cultivated crops as sorghum or late-planted corn.

Seed of Dixie shattered in harvesting operations has successfully produced good volunteer stands in fall. When used in rotations with

cultivated crops, the seed must be matured before the seedbed is prepared for the following crop. When Dixie is used in pasture, care should be taken to prevent close grazing at the time of blooming, since it may limit the quantity of seed produced and cause thin fall stands. Summer-growing grasses must be either closely grazed or clipped in fall to give the clover seedlings a chance to become established.

The seed and plants of Dixie cannot be distinguished from common crimson clover, and the variety may be readily contaminated by either cross-pollination or mechanical mixtures. For these reasons the farmer buying Dixie should buy only certified seed.

Rate and Time of Seeding

Under ordinary conditions 12 to 15 pounds of hulled seed to the acre will give good stands unless there is lack of soil moisture. Depending upon the quantity of chaff and pieces of stems, 45 to 60 pounds of unhulled seed is comparable with 15 pounds of hulled seed. Crimson clover may be sown from the middle of July until November, depending upon the location, with the expectation of obtaining a good stand. The later it is seeded the less growth can be expected and the more readily winterkilling occurs. Early establishment becomes more important as plantings are extended northward. Seeding crimson clover either immediately before or following heavy rains, if possible, increases its chances of making a stand. Spring planting in or south of the Corn Belt usually results in a short, stunted growth followed by little blossoming and low yield.

Inoculation

In many areas where crimson clover has been grown successfully for several years it is not necessary to inoculate the seed with bacterial cultures for the production of nodules. But either the seed or the soil must be inoculated if crimson clover has not been grown. If the plants are not inoculated they will develop slowly, become yellow, and die. Inoculated plants are able to obtain about two-thirds of their nitrogen from the air through their root nodules. The plants may be artificially inoculated by applying cultures of the bacteria to the seed or by scattering soil from a field where inoculated crimson clover has been grown. Two hundred to three hundred pounds per acre of such soil evenly distributed at seeding time is usually sufficient.

When crimson clover is grown for the first time an additional inoculation treatment is recommended if weather conditions are dry and hot after seeding. This supplemental inoculation consists in mixing commercial cultures with sand, soil, or cottonseed meal and broadcasting the mixture over the soil surface during cloudy, rainy weather as the young seedlings are emerging. A bushel-size culture mixed with 60 pounds of the above-mentioned material is sufficient for an acre if distributed evenly. Soil from a field where inoculated crimson clover has been grown may also be used for the supplemental treatment.

Unhulled Seed

Using unhulled common seed increases the chance of obtaining thick stands. When the soil is dry, light rainfall does not cause the unhulled seed to sprout, but hulled seed germinates readily and the

seedlings may die from lack of moisture before they can become established.

Its bulky nature makes unhulled seed more difficult to distribute uniformly than hulled seed. It must be broadcast and may be harrowed in. It is also difficult to market and is not generally handled by the seed trade. But farmers can harvest seed for their own use and save the expense of having it hulled.

Companion Crops

Rye, vetch, ryegrass, and fall-sown grain crops are often seeded with crimson clover. Such crops are seeded at half to a third the normal rate, and the crimson clover is seeded at half to two-thirds the normal rate. Seeding is done at the same time, but, as a greater depth is required for most of the seed of the companion crops, two seeding operations are necessary.

Farmers often use a mixture of 5 pounds of red clover and 10 pounds of crimson clover per acre with excellent results. The first growth of the mixture may be grazed or harvested for hay or for crimson clover seed, while the second crop is wholly red clover. Dixie crimson clover has given good results when planted with Johnson and Bermuda grasses.

Diseases and Insects

The most serious disease that affects crimson clover is crown rot. The effect of this disease is seen early in spring and is characterized by the plants dying in patches. The stems rot at the surface of the soil or where they join the crown. Continued damp, cool weather during winter and early spring favors the development of the disease. This disease can be controlled by not growing clover or other legumes in rotation for 2 to 5 years.

Sandy soils in the southern part of the crimson clover belt are often infested with nematodes. Nematode injury stunts and yellows the plants. While the clover-seed chalcid, the pea aphid, and other insects sometimes become numerous in crimson clover, insects do not ordinarily cause appreciable damage.

Utilization

Crimson clover grows rapidly in fall and spring and furnishes an abundance of grazing (fig. 3). If planted early and good fall growth is made, the clover may also be grazed during the fall and winter months. Such a practice has been successfully followed in many States where crimson clover is providing winter pasture. Crimson clover combined with small grains or ryegrass has been most widely used for winter grazing. Crimson clover makes little growth during cold periods in winter. Under such conditions, to prevent close grazing, it is necessary to remove the animals or shift them to other fields that have not been grazed.

Animals grazing on crimson clover seldom bloat; however, it is advisable not to turn them into clover fields for the first time when they are hungry. Bloat is less likely to occur on a mixture of clover and grass or grain than when the clover alone is grazed. As crimson clover reaches maturity the hairs of the heads and stems become hard

Figure 3.—Crimson clover provides an abundance of early spring grazing.

and tough. When it is grazed continuously or when it is fed as hay at this stage large masses of the hairs are liable to form into hair balls in stomachs of horses and mules, occasionally with fatal results. If small quantities of other feeds, particularly roughages, are fed along with the clover, the formation of these balls will be reduced. Cattle, sheep, and swine do not seem to be affected.

Crimson clover makes excellent hay when cut at the early-bloom stage, although the yield may be slightly reduced. For best yields it should be harvested in full bloom. The hay is easily cured either in the swath or in the windrow. Fewer leaves are lost and less bleaching occurs in windrowed hay. Although yields as high as $2\frac{1}{2}$ tons per acre are not uncommon on fertile soil, $1\frac{1}{2}$ to 2 tons is the usual harvest.

Crimson clover is an ideal green-manure crop. For best results it should be plowed under 2 to 3 weeks before the succeeding crop is planted. This gives enough time for decomposition, which is rapid unless the crop is ripe when turned under. Occasionally strips are plowed in which row crops are to be planted, allowing the clover between the plowed strips to mature. Seed may be harvested by hand from the clover between the row crops, and the remaining clover straw allowed to mat and serve as a mulch, or the entire plant may be permitted to form a mulch.

Crimson clover may be made into silage by the same methods as are used for other legumes and grasses. In orchards it is often allowed to mature, after which it is disked into the soil. A volunteer stand from shattered seed may be obtained in fall by using the Dixie variety.

Seed Production

Crimson clover is a heavy seed-producing plant, and yields of 5 to 10 bushels per acre are common, depending upon the thickness of the stand, the extent of growth produced, and the care used in harvesting the seed. The florets are self-fertile, but bees increase the number of seed per head by tripping and transferring the pollen. Placing colonies of honeybees next to blooming fields will increase pollination.

More seed is usually produced on soils of medium fertility than on rich soils, since fertile soils seem to stimulate the growth of stems and leaves rather than develop flower heads.

Large yields and ease of harvesting seed are two important reasons why crimson clover is such an ideal legume crop. Farmers can save seed with very little expense other than their own labor. When the seed heads are mature they readily shatter and are easily harvested either by hand stripping or by using horse-drawn home-made strippers. One bushel of unhulled seed contains about 2 pounds of hulled seed, and although bulky, it can be easily stored on the farm until fall.

When the seed is mature the crop is cut with a mower (fig. 4), which

Figure 4.—Crimson clover seed crop cut with a mower equipped with a bunching attachment.

may be equipped with a bunching or windrowing attachment, or it can be harvested with a combine. During wet seasons it is sometimes difficult to combine the seed from standing plants. Under such conditions the plants can be cut and windrowed and then threshed by the combine from the windrow. As crimson clover shatters easily when ripe, cutting with the mower when the heads are damp with dew or rain is recommended. If it is allowed to stand too long after ripening a beating rain will shatter much of the seed. After a few days of curing, the seed is hulled with an ordinary clover huller, with a grain separator equipped with hulling attachments, or by a combine equipped with pick-up attachments or used as a stationary machine. The less the clover is handled the less seed will be lost by shattering.

Many troublesome weeds are difficult to separate from crimson clover seed, including field peppergrass (*Lepidium campestre*), wintercress (*Barbarea praecox*), and the bulblets of wild onion (*Allium* spp.), which are probably the worst. Seed of the mustards, rapeseeds, and turnips (*Brassica* spp.), dock (*Rumex crispus*), wild geranium (*Geranium dissectum*), sorrel (*Rumex acetosella*), and catchweed (*Galium aparine*) are also found in the seed. Little barley (*Hordeum pusillum*) is a pest in unhulled seed, and the use of such seed will naturally increase the prevalence of this weed.

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