RED CLOVER

In Kentucky

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Red clover is a valuable forage crop in Kentucky. It is nutritious and palatable to livestock and fits well into all ordinary cropping systems. Special soil treatments are not required on soils producing good yields of other crops in the rotation, and red clover can be seeded easily and at moderate cost. The crop may be used for hay, pasture, seed, or soil improvement as the farmer's need may indicate.

Red clover, however, could be much more valuable if greater care were given to its production and utilization. This publication gives detailed information on the care and production of red clover including soil preparation, varieties, harvesting seed, controlling diseases and insects, and curing for hay.

GENERAL INFORMATION

Red clover is a perennial legume, and in some parts of the world it lives 4 to 6 years. In Kentucky, however, crop stands are seldom good beyond 2 years; however, properly managed fields of a well-adapted variety may have good stands into the third year.

Red clover, alone or in mixture with grass, was grown annually on about 470,000 acres of crop land in Kentucky in the period 1957-61. This acreage is about 13.5 percent of the harvested-crop acreage of the state. The crop is grown mostly in short rotations, usually following a small grain crop and preceding corn or tobacco. Red clover is also grown on a considerable acreage of pasture land.

SOIL REQUIREMENTS AND SOIL TREATMENTS

Red clover grows best on well-drained loam soil. However, it is adapted also to soils that are not so well drained. Most soils of the state producing good-to-high yields of corn, tobacco, and small grains also will produce good crops of red clover. Nevertheless, some of these soils may need lime, or fertilizer, or both, especially after a high-yielding nurse crop has been harvested. High-yielding grain crops

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[1] The author had the assistance of the following members of the Agronomy Staff in the preparation of this publication: J. F. Freeman, Lawrence Henson, H. F. Miller, W. H. Stroube, N. L. Taylor, T. H. Taylor, and Warren Thompson.

are likely to remove so much of the available mineral nutrient supply from the soil that not enough is left to produce a good crop of clover. In that case topdressing the clover field with fertilizer the following spring would be profitable. Likewise, if a field is to be allowed to go through the third year, topdressing it in the spring with fertilizer would likely pay.

A soil test is helpful in determining whether topdressing a red clover field is needed. If the soil is low or very low in both phosphorus and potassium, annual applications of 300 pounds of 0-20-20 fertilizer or its equilvalent would likely be profitable. If only one of the elements seems to be needed, the proper single-element fertilizer should be applied.

Lime

Red clover grows best at a range in soil pH from about 6.0 to above 7.0. Slightly acid soil needs 2 tons or less of ground limestone per acre, and moderately acid soil from 2 to 3 tons. Soils having a pH of 5.5 or below should be limed 6 months to a year before seeding red clover.

Phosphorus

Red clover crops grown on soil low in available phosphorus are likely to produce low yields. Many soils in Kentucky are deficient in this element; therefore, phosphate fertilization is needed rather generally in this state.

Potassium

Many soils in Kentucky need fertilization with potassium to produce good yields. This element is especially valuable in prolonging the life of clover stands, especially those grown with grass.

Magnesium

Red clover has an average magnesium content higher than any other commonly grown forage legume. Consequently, perhaps some crops of red clover in Kentucky need more of this nutrient than they get. Liming the soil in part with dolomitic limestone would supply the magnesium requirements.

Boron

It is not know whether red clover crops in Kentucky suffer from boron deficiency, but undoubtedly some do. Boron fertilization has been reported to be beneficial in Tennessee. Red Clover grown on boron-deficient soil has fewer branches and flowers than clover grown on soil having ample boron. Safe rates of boron fertilization range from 20 to 30 pounds of borax per acre.

VARIETIES

The two major kinds of red clover are medium and mammoth. Very little mammoth red clover is grown in Kentucky, since, as a rule, only one cutting per year is obtained. This clover grows taller and has coarser stems than the medium red type and blooms about 2 weeks later.

There are many varieties of medium red clover. One of these is Kenland, developed by the University of Kentucky Agricultural Experiment Station in cooperation with the United States Department of Agriculture. Parent varieties were Ky 101 and Ky 215; Virginia varieties Sanford and DeJarnette; Tennessee Anthracnose Resistant; North Carolina variety Hahn; and Missouri variety Plassmeyer. Certified seed of Kenland can be purchased from most seed dealers in Kentucky. Kentucky-grown certified Kenland seed has been superior in Kentucky experiments to most lots of western-grown certified seed.

The superiority of Kenland red clover in central Kentucky over other varieties and ordinary kinds of red clover is shown in Table 1 and Fig. 1. Tests also indicate that Kenland is about as superior in western Kentucky as it is in the central part of the state.

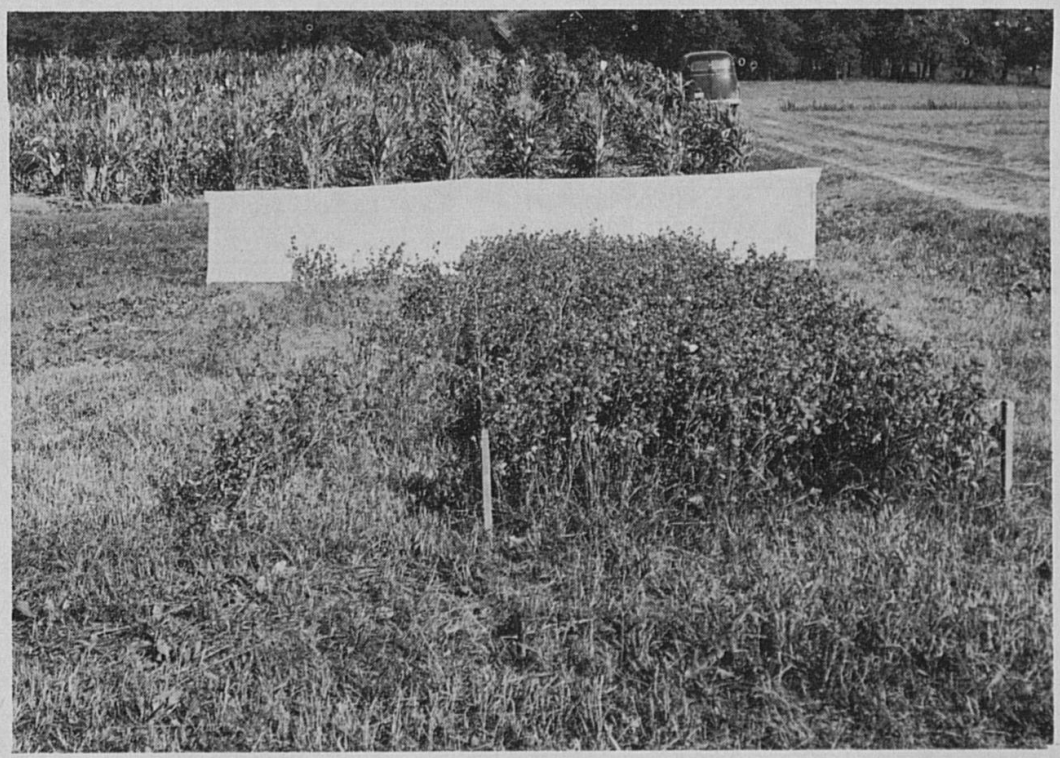

Fig. 1.— A plot of second-crop Kenland variety red clover is shown on the right and a plot of the northern variety Wegner on the left. Growing an adapted variety of red clover is necessary for good yields.

Table 1.— Yield of Red Clover Varieties at Two Locations in Kentucky (Tons of Hay)*

Variety	Woodford county Seeded March 13, 1957 Yields in			Mason county Seeded March 18, 1959 Yields in		
	1958	1959	Total	1960	1961	Total
Kenland†	4.46	0.42	4.88	3.12	2.45	5.57
Chesapeake	3.78	0.23	4.01	2.89	0.52	3.41
Pennscott	3.10	0.00	3.10	2.70	0.38	3.08
Lakeland	2.91	0.00	2.91	2.19	0.40	2.59
Dollard	2.87	0.00	2.87	1.42	0.14	1.56
Common	2.67	0.00	2.67‡	3.08	0.68	3.76§

* Hay containing 12 percent of moisture. Yields of the varieties were not determined in 1957 in the Woodford county test or in the Mason county test in 1959 because all varieties appeared to have produced equally well in the year when sown.

† The Kenland seed used in these experiments was grown in Kentucky.

‡ Average of two lots Kentucky-grown common, and one lot Oregon-grown common.

§ Average of four lots Kentucky-grown common.

SEED INOCULATION

Red clover should be inoculated before sowing. Seed inoculated with commerical cultures will assure better nitrogen fixation than occurs naturally by bacteria in the soil. Using a "sticker" to hold the inoculant on the seeds is likely to improve inoculation; a weak sugar solution is satisfactory.

SOWING THE SEED

As a rule, the best time to sow red clover in Kentucky is from the latter part of February in the southwestern part of the state to the middle of March in the most northern part of the state.

Most spring seeding is made in small grain because it is easily and cheaply done at that time, and the small grain holds weed growth in check while the clover is getting started. The seed should be covered shallow. Freezing and thawing of the soil will sometimes provide satisfactory covering. Also, sheep grazing the nurse crop will tramp the seed into the soil. Usually, however, it is best to disk or harrow the soil lightly at the time of seeding. Uncovered seed is not likely to produce a good stand of clover.

Late summer seedings are usually successful in Kentucky if made on a seedbed that has been fallowed to prevent weed infestation and given final preparation for seeding with a cultipacker. Dry weather is, of course, a frequent hazard. The seed should be covered lightly. Seeding should be done from mid-August in northern Kentucky to about the last of August in southwestern Kentucky. Summer seedings are sometimes severely damaged by crown rot during the following winter and spring.

Recommended rates of seeding red clover alone are 8 to 12 pounds per acre of seed of high germination.

SOWING GRASS WITH RED CLOVER

In Kentucky, a grass should usually be seeded with red clover. The mixture is superior to clover alone in protecting soil from erosion, and leaching, and controlling weeds. Mixed clover hay cures more rapidly than pure clover hay, and the mixture may produce more hay per acre. The useful life of mixed seedings is also longer than pure clover stands. This is especially important if the seeding is for pasture or for hay and pasture. Furthermore, animals are less likely to bloat while on the clover-grass pasture than when on pure clover pasture.

Each of the grasses used generally in Kentucky—Kentucky bluegrass, Ky 31 fescue, orchardgrass, redtop and timothy—grows well with red clover and produces a good mixture for hay or pasture, or both. It is believed that Clair timothy is especially useful in hay mixtures because of its high yield and long life. It is also ready to be cut for hay when red clover should be harvested. Mixed seedings of Kenland red clover and Clair timothy will usually produce considerable aftermath for grazing if the first crop is harvested at the proper time, that is, 10 to 15 days after clover begins to bloom.

Grasses should normally be sown in late summer or early fall in the small grain in which red clover will be sown in the spring. Rates of seeding of both grass and clover may be reduced one-fourth to one-third when sown for a mixture.

CARE OF RED CLOVER FIELDS IN THEIR FIRST YEAR

Most red clover is sown in small grain. These grain crops compete with the young clover for mineral nutrients, moisture, and light. Sometimes the competition is so severe that stands of the young clover plants become very poor by the time the grain crop is harvested. Nurse-crop competition can be reduced greatly by grazing or clipping the small grain in late winter or early spring before the stems begin to grow.

Young clover stands will usually be damaged severely if the straw of the grain crop is left on the field following combining. Consequently, the straw should be removed within a few days after combining. Later, the clover should be mowed and the stubble, weeds, and clover removed unless the total amount of material is quite light. Pasturing red clover fields in their first year is beneficial to the clover. Regardless of which is practiced, mowing or pasturing should be done

before September 1 in northern Kentucky and September 15 in southwestern Kentucky. If done later, winterkilling is likely to be severe.

USING RED CLOVER IN ITS SECOND YEAR

The first crop of red clover is almost always harvested for hay, or occasionally for silage. (For information on grass silage, see your county agricultural extension agent.) If properly made, red clover hay is nearly equal to alfalfa in feeding value. *Practically all red clover in Kentucky is cut much too late* to make high-quality hay (Fig. 2). Experiments show that it should be cut when in early bloom. When the first crop of red clover is cut too late to produce high-

Fig. 2.— Three plots of third-year red clover which were cut for hay at different times in their second year are shown above. The plot on the left was cut for hay 10 days after the first blossoms appeared; the plot on the right 10 days later; the plot in the center 40 days later. As a rule, stands of red clover are proportionately poorer at the end of the second year because they are usually cut for hay later than about 20 days after the stand begins to bloom. Most red clover in Kentucky is cut for hay much too late.

quality hay, the immature second growth is cut at the same time. This weakens the plants, and the stand is likely to become quite poor before the end of summer.

It is sometimes impossible in Kentucky to determine when red clover is in its early bloom stage of growth because most heads of the first crop are often destroyed by the lesser clover-leaf weevil. It is best, therefore, to cut all fields about 15 days after the very first bloom appears. Usually the first crop should be cut between May 20

and 25 in southern Kentucky and May 25 to June 1 in northern Kentucky. If a grass is grown with red clover for hay, the mixture should be harvested when the clover should be cut rather than when the grass should be cut.

The second crop of red clover is generally pastured, harvested for seed, or used only for soil improvement. Hay made from this crop is occasionally unpalatable to cattle and, perhaps, to sheep. The cause is not known.

If the first crop of adapted red clover is cut for hay at the proper time and weather conditions remain favorable, at least two additional hay crops may be harvested.

CURING RED CLOVER HAY

Most of the red clover hay made in Kentucky is cured and baled in the field. To be high grade, the hay must be leafy, somewhat green, practically free of weeds and other foreign material, and have a pleasant odor. It is difficult to make hay of this quality in Kentucky because weather conditions frequently are unfavorable for curing in the field. Local weather forecasts can be helpful in avoiding any weather that may be unfavorable for curing hay. The best practice appears to be to allow the crop to wilt in the swath and then to rake it into small, loose windrows. The clover cures about as rapidly in these windrows as in the swath, and fewer leaves are lost in baling. Using a hay conditioner following the mower will greatly speed curing in the field and result in hay of higher quality than is otherwise secured.

GRAZING RED CLOVER

Red clover pasture is relished by all classes of livestock including swine. It may be used as a temporary pasture without giving much attention to grazing management; however if it is to be grazed rather intensively for long periods, the field should be divided and the divisions grazed in rotation. However, if a field is grazed down slowly so that it produces many crown leaves as it is grazed, red clover withstands moderate continuous grazing quite well.

Cattle on red clover pasture occasionally bloat. Second and third growths of red clover sometimes appear to be unsatisfactory pasture for breeding ewes.

RED CLOVER FOR RENOVATING PASTURES

Red clover is one of the better legumes for use in pasture renovation. Seedings of this clover produce good stands as a rule with little

or no tillage of the grass sod, provided the grass is grazed or clipped closely.

In pasture renovation experiments at Lexington, the Eden Shale Farm in Owen county, and in Christian county, red clover sown on well-fertilized soil and closely clipped or moderately disked sod increased pasture yields from 23 to 100 percent.

It is recommended that 8 to 12 pounds of red clover seed be sown in renovating pastures. Spring seedings are likely to be more successful than late summer and early fall seedings. (For information on renovating pastures see your county agricultural extension agent.)

HARVESTING RED CLOVER SEED

An advantage of red clover as a farm crop in Kentucky is that both hay and seed may be harvested from it in its second year. An average of 17,600 acres of red clover was harvested for seed annually in Kentucky in the 5-year period 1957-61 (Fig. 3). The average yield was 76 pounds of seed per acre for which the farmer received $20.78 on the average. Experiments have showed that Kentucky's average yield could be doubled if the soil were properly limed and fertilized for growing red clover, the Kenland variety grown generally, and the first hay crop cut at the proper stage to produce the best quality of hay. (See section "Using Red Clover in Its Second Year.") When bumblebees are scarce, setting hives of honey bees in the field may increase clover seed yields considerably.

Red clover is ready to harvest for seed when practically all heads are brown or black. Ordinarily the mature crop is not sufficiently dry to be combined standing. Usually it should be cut and allowed to dry thoroughly before it is threshed. If the necessary mower attachments are available, the material may be bunched or windrowed as cut, thus reducing the loss of heads as well as labor. Ordinarily, the crop is left in the swath or windrow until thoroughly dry, and then combined. If this is not possible, the crop should be put in the mow or stacked when dry for latter threshing. It should be handled carefully to prevent loss of heads.

Practically all red clover seed harvested in Kentucky must be threshed with a combine harvester. Usually the machine will do a good job of threshing if the material is dry, and the screens and air blast are as recommended by the manufacturer. Slight modifications may be helpful, but failure to obtain good results from a combine adjusted according to the manufacturer's specifications occurs usually because the machine is overloaded or the crop is not thoroughly dry. If the crop is combined from the swath or windrow, the

Fig. 3.— A seed crop of Kenland red clover in Bourbon county is shown here. Good crops of seed can be grown in all parts of Kentucky. Approximately 1,200,000 pounds of red clover seed was harvested from 16,000 acres in the state in 1962. A much higher production can be obtained by following recommendations in this publication.

ground speed must be such that the machine picks up the material slowly and at a uniform rate. If seed is being lost when combining directly from the swath or windrow, it would be advisable to use the combine as a stationary thresher. In this way the straw can be re-threshed until all of the seed is obtained. Sometimes one half or more of the seed may be lost when combined directly from the swath or windrow.

Combined red clover seed may heat in the bin or bag; consequently, it should be examined frequently until all danger of heating is passed. If it begins to heat, it should be spread in a thin layer on a dry floor and shoveled or stirred frequently until thoroughly dry. Putting it through a fanning mill to remove foreign matter may aid in drying the seed.

Red clover seed usually is not clean enough when it comes from the combine to be satisfactory for sowing or marketing; it should, therefore, be recleaned. Many kinds of foreign material can be removed on the ordinary fanning mill equipped with proper screens; however, a few weed seeds—dodder and buckhorn in particular—can be completely removed only by special machines. Special effort should be made, therefore, to destory these weeds or to remove them from the field before the crop is harvested.

Buckhorn plants are present in almost all red clover fields in Kentucky. Where the clover acreage is small and the buckhorn plants are few, the most feasible way to destroy them may be by digging them in early spring just before the clover begins to grow. Where this job would be too large, these and several other weeds may be controlled by spraying the field with the herbicide 4 (2,4DB) in the amine form. Spray in the spring as soon as the buckhorn begins active growth or in the summer after the hay crop is harvested, using 1½ to 2 pounds of 4 (2,4DB) acid equivalent per acre in 15 to 30 gallons of water applied with a boom sprayer. This herbicide may also be used as an early postemergence spray when the clover seedlings are 2 to 3 inches tall. Postemergence treatment in the spring will control several broad-leaf weeds, but may not control buckhorn. For postemergence treatment, use 1 to 1½ pounds of the acid equivalent per acre in 15 to 30 gallons of water for boom spraying. Using the herbicide on clover at either time will reduce the vigor of the plants somewhat. *Do not use the field for pasture or hay for the next 30 days.*

Dodder grows as a parasite on red clover. It usually occurs in spots in red clover fields in Kentucky. The clover in these spots may be cut with a sickle and removed from the field. These areas may also be destroyed with a burner, preferably one using propane or butane fuel. Herbicides also have been found useful. The most effective ones appear to be (1) aromatic weed oils, and (2) a mixture of DNBP (4, 6-dinitro ortho secondary butyl phenol) and diesel or other fuel oils. The latter spray is made by putting the two materials together at the rate of 1 pint of DNBP and 50 gallons of oil. Enough spray must be used to obtain a complete coverage of both plants. This spray may injure or even kill the clover plants.

Red clover fields that are largely or completly infested with dodder should not be harvested for seed. These fields should be harvested for hay *before any dodder seeds mature* or grazed closely from the time the dodder appears in the field.

CONTROLLING DISEASES OF RED CLOVER

Several diseases attack the leaves, stems, and roots of red clover. Perhaps viruses, crown rot, and southern anthracnose are the most destructive to stands. The best means for holding all clover diseases in check is to manage the clover properly—that is, lime and fertilize the soil as needed for clover and cut for hay at the proper time. Growing an adapted variety is also important. The Kenland variety is highly resistant to southern anthracnose, but only slightly resistant to some other diseases of red clover.

CONTROLLING DESTRUCTIVE RED CLOVER INSECTS

Insects that sometimes cause considerable damage to red clover in Kentucky include aphids, leafhoppers, spittlebugs, and grasshoppers. Ordinarily the damage is not severe enough to call for the use of insecticides, but if such control seems desirable ask your county agricultural extension agent for directions.

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