



RED CLOVER *(Trifolium pratense)*

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Red clover is an herbaceous perennial or biennial legume with erect, leafy stems that originate from a thick crown and terminate with a flower head. Height at maturity is about 2 feet.

Leaves are composed of three oblong leaflets that usually have light-colored "V" markings at their center. Both leaves and stems usually are hairy.

Flowers are pink-purple or magenta. Seeds are small (approximately 240,000 seeds/lb), oblong, and yellow, reddish-brown, or dark gray.

Red clover has a branched taproot and extensive surface roots.

When used in annual rotations, fall and winter growth is slow, but spring growth is rapid.

Environmental preferences and limitations

Red clover grows well on loams, silt loams, and sandy loams as well as on clayey soils. It can survive winter temperatures as low as -30°F and tolerates temporary waterlogging, but cannot survive prolonged waterlogging or flooding. The optimum pH range is 6.6–7.6, but a range of 4.5–8.2 is tolerated.

Uses

Red clover is used successfully in Oregon as a fall-planted cover crop and green manure in rotations with vegetable crops. It also is used as a relay interplanted cover crop (i.e., planted into a standing crop) and makes excellent forage, hay, and silage, although it should not be used as sheep pasture during breeding season because its high

concentrations of estrogen-like compounds may cause infertility.

Red clover residues can supply significant amounts of nitrogen (N) to subsequent crops, and the large, deep taproot is effective for loosening soils and cycling nutrients to the surface. Vigorous spring growth is effective for suppressing weeds.

Dry matter and N accumulation

In a 5-year trial in the mid-Willamette Valley, 'Kenland' red clover planted in mid-September accumulated a maximum of 3.3, minimum of 0.2, and mean of 1.7 tons dry matter/acre, and a maximum of 168, minimum of 10, and mean of 83 lb N/acre by mid-April.

Management

Suggested fall planting dates are from mid-September through early October, or earlier if irrigation is available or soils are moist.

Seeding rates for use as a cover crop vary from 15 to 25 lb/acre. Drill seed into a fine seedbed at a depth of ½ inch for best stand establishment. Alternative seeding methods that can reduce seedbed preparation but require higher seeding rates are: drill into a rough seedbed prepared by disking, or broadcast over a rough or smooth seedbed and then disk lightly to cover seed.

Red clover roots need to be

colonized by an *appropriate* strain of rhizobia bacteria to be able to convert atmospheric nitrogen into plant-available forms. Inoculating seed with the proper rhizobia bacteria ensures that the bacteria will be present when the seed germinates.

Use fresh inoculant, protect it from heat and light, and apply it to seeds just before planting according to the manufacturer's directions. Cover broadcast seed with soil to protect inoculant from sunlight.

You may not need to inoculate if the appropriate rhizobia bacteria already are present in the soil. You can find out by planting a section of the field with raw (non-inoculated) seed and watching for differences in growth.

When relay interplanting, broadcast seed into a standing vegetable crop before the final cultivation. Increase irrigation frequency to keep the soil surface moist until the clover is established under the summer crop canopy (about 2 weeks).

Quick facts: Red clover

Common names	Red clover
Hardiness zone	4 (see Figure 1)
pH tolerance	4.5–8.2; optimum near 7.0
Best soil type	Wide range
Flood tolerance	Moderate
Drought tolerance	Moderate
Shade tolerance	Moderate
Mowing tolerance	High if mown higher than 5 inches
Dry matter accumulation	1.7 tons/acre
N accumulation	85 lb/acre
N to following crop	Half of accumulated N
Uses	Use as relay-interplanted or winter annual cover crop in rotations, or as a cover in orchards to smother spring weeds, fix N, and improve soil tilth. Often grown with cereal grains. Tolerates frozen soils.

Cautions

May become weed in annual crop rotations.

Red clover has performed well when relay interplanted into short-statured crops. When relay interplanted into tall-statured crops such as sweet corn, intense shade, heavy harvest residue, and harvest traffic result in patchy stands. However, red clover appears to be better adapted to these adverse conditions than the vetches, peas, or crimson clover, accumulating as much as 1½ tons dry matter/acre and 80 lb N/acre by the end of April in the Willamette Valley.

In western Oregon, red clover generally is allowed to grow until at least mid-April, because nearly all dry matter and N accumulation occur in spring with the onset of warm weather. Incorporating red clover residues approximately 3 weeks before the summer crop is planted maximizes red clover spring growth while minimizing pythium problems (see below).

When grown alone, red clover's succulent residues are incorporated easily with a moldboard plow or disk and decompose very rapidly, releasing part of the accumulated N for use by the following crop.

Red clover often is planted with a cereal grain companion crop that is able to scavenge N and protect the soil during fall and winter. Plant companion crops at approximately one-half, and clover at two-thirds, of their monoculture seeding rate. If the companion crop is too dense in spring, grazing or clipping it before

clover stems begin to grow confers a competitive advantage to the clover.

Red clover can be killed with an appropriate herbicide. Consult your county agent of the OSU Extension Service for herbicide recommendations. Follow all label restrictions.

Pest interactions

Red clover is not an appropriate cover crop to grow in rotation with a cash crop legume because they are susceptible to many of the same pathogens, allowing pathogen populations to grow quickly.

Incorporation of succulent red clover residues often causes a sharp increase in soil-borne pathogen populations, especially damping-off fungi (e.g., *pythium*). If susceptible seed is planted shortly after incorporation, you may have more problems with disease. Avoid this problem by waiting several weeks between residue incorporation and planting, and by ensuring that soil temperature and seedbed preparation are optimal for rapid summer crop seedling emergence.

Varieties/cultivars

Cultivated red clovers are grouped as early flowering or late flowering types. 'Mammoth Red' is one of the most common late flowering, or single cut, varieties, and is used at high elevations or where the growing season is short. It is a winter-hardy biennial that grows in a round clump without flowering stems the first year.

The early flowering types, also called 'Medium Red' or double cut (because they can be cut several times in a year for hay), comprise the

majority of red clovers sown in Oregon. They produce tall, erect flowering stems with leaves at the nodes, the spring after they are planted. Although they are perennials, early flowering red clovers most often are treated as winter annuals (turned under or killed in spring) when used as a cover crop. Seed often is marketed simply as "Medium Red clover" and, if locally produced, may be well adapted.

'Kenland' red clover has been used successfully in the Willamette Valley as both a fall-planted and relay-interplanted cover crop. It is resistant to *Sclerotinia* crown rot and is tolerant of waterlogged soils. 'Kenland' red clover is nearly dormant during late fall and winter but grows rapidly in spring with the onset of warmer temperatures.

For more information

World Wide Web

Orchard floor management information—<http://www.orst.edu/dept/hort/weeds/floormgt.htm>

OSU Extension Service publications—eesc.orst.edu

The University of California, Davis cover crop information—<http://www.sarep.ucdavis.edu/sarep/ccrop/>

Oregon Cover Crop Handbook

This publication also is part of *Using Cover Crops in Oregon*, EM 8704, which contains an overview of cover crop usage and descriptions of 13 individual cover crops. To order copies of EM 8704, send your request and \$5.50 per copy to:

Publication Orders
Extension & Station Communications
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Figure 1.—Oregon plant hardiness zone map. Red clover normally will survive in Zone 4 or any warmer zone. (Extracted from the USDA's national plant hardiness zone map, based on average annual minimum temperature in °F.)

Zone 4 = -30 to -20; Zone 5 = -20 to -10
Zone 6 = -10 to 0; Zone 7 = 0 to 10
Zone 8 = 10 to 20; Zone 9 = 20 to 30

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