

Red Clover Seed Production

This publication is a guide for red clover seed production. Keep in mind local conditions and your experience as a producer when using this information.

Red clover is a short-lived perennial. The two types of red clover grown in Canada are late flowering single-cut cultivars and early flowering double-cut cultivars. In the single cut cultivars, seed is produced only in the second and subsequent years. Single-cut cultivars are hardy and are usually grown in the parkland area of the prairies and in the northern areas of British Columbia and Alberta. Double-cut varieties are not as winter hardy.

The growth habit of red clover varies from erect to decumbent, with numerous leafy stems arising from the crown each year. The large leaves are divided into three leaflets, and usually bear a horseshoe shaped mark. The underside of the leaves are hairy. Heads consist of approximately 125 flowers. Flowers are predominantly self-sterile and require pollination by bees for seed set. The pods are short and single seeded.

Seed and seed yield

The yield potential varies among varieties. Average seed yields are about 250 lb/acre, and can range from 100 to 500 lb/acre.

Secure seed stocks early. Always request the seed testing certificate before purchasing your seed stocks. This document lists the types and numbers of weed seeds. It will also indicate the per cent germination. Seed yield can be reduced by excessive vegetative growth to the point of lodging, cool weather in July and August, and lack of pollination.

Pedigreed seed production

There are currently four classes of forage seed: Breeder, Foundation Registered and Certified. The Registered class is rarely used in Canada.

Breeder seed is the highest class of seed. Foundation seed is the next class of seed. Foundation seed is the class required by producers producing certified seed. American varieties registered for use in Canada may be imported at the registered class which is eligible to produce certified seed.

Certified seed is at the lowest end of the pedigreed chain. Producers planting certified seed for seed production, are only eligible to produce common seed. Common seed is not eligible for pedigree and the variety name cannot be used to identify common seed.

Refer to the Canadian Seed Growers' Association's *Circular 6* for additional information on pedigreed seed production.

Production trends and marketing

Red clover seed is produced in all parts of Canada. Double-cut types predominate from Ontario eastward, while in the western provinces, single-cut varieties make up the majority of acreage. Ontario is by far the largest producer of double-cut red clover. Of the single-cut types, Alberta has traditionally been the most important producing province, followed by Saskatchewan.

Canadian production of single cut red clover seed averages about three million kilograms annually although in 1970, output was more than six million kilograms. Alberta's share of the national total has ranged from 30 per cent to more than 70 per cent over the past couple of decades.

Pedigreed acreage can vary significantly from year to year. The long-term average for pedigreed seed in Canada is about 2,000 acres, about half of which is grown in Alberta. There is usually a much larger area devoted to common seed production. At one time the total area intended for single cut red clover seed may have been as high as 90,000 acres.

A large proportion of Canadian production is exported. The United States is traditionally our single most important market. In that country red clover seed is primarily used as a top dressing for winter wheat for ploughdown purposes.

Producer prices have varied widely averaging about 37 cents per pound for common seed in the 1980s. Currently prices are below the 10-year average, reflecting a situation of too much product relative to buyer interest.

Choice of land

Seed into a clean field. Perennial weeds such as Canada thistle, perennial sow-thistle, toadflax, and quackgrass should be controlled before seeding with tillage and/or a herbicide such as Roundup.

Avoid planting red clover in fields contaminated with night flowering catchfly, stinkweed, American dragonhead, lambsquarters, cleavers, brassicas, alfalfa and other clovers, because it will be extremely difficult to remove these seeds from the red clover seed.

Legume cropping is restricted on land that has been treated with Atrazine, Banvel, Glean, Ally, Lontrel, Princep, Sinbar and Tordon 202C. Check *Crop Protection* (the Blue Book), Agdex 606-1; or the herbicide container labels for wait periods before seeding red clover.

Well-drained soil that receives adequate moisture is the main requirement for growing red clover. Loam, silt loam and clay soils are preferred to light, sandy or gravelly soils. Red clover will grow on moderately acid soil, but maximum yields are obtained when calcium levels are adequate and the pH is 5.5 or higher. Red clover is intolerant of drought and salinity.

Wet years can result in excessive vegetative growth and decreased seed production.

Stand establishment

Seed bed preparation

Red clover should be seeded into a firm, moist seed bed that is weed free. Soils that are low in organic matter may crust after a rain. Red clover should be seeded at a 1/2 to 1 inch depth.

Inoculation

Selection of the proper rhizobia (*Rhizobium trifolii*) is essential. The use of a sticking agent is recommended. Seed should be inoculated just before seeding. Store inoculants and pre-inoculated seed in a cool dark place.

Seeding rates

There are 605,000 seeds/kg (275,000 seeds/lb). Ten to twelve plants per square metre (one per square foot) is satisfactory for seed production.

The recommended seeding rate is 2 lb/ac. This will allow for about 12 seeds per square feet. Higher seeding rates of four to six lb/ac will improve establishment.

Seeding date

Seed red clover in the early spring. However, red clover should be seeded no later than the first week in July, providing soil moisture conditions are adequate. The later the seeding date the higher the risk of winter kill.

Row spacing

Row spacing for seeding ranges from six to 18 inches. A six inch spacing is the most common. Some producers suggest broadcasting seed is more practical. If the broadcast method is selected, harrowing is required to incorporate the seed into the top inch of firm soil.

Companion crops

Companion crops are not recommended due to their competitive nature. If a companion crop is used, wheat and flax are normally less competitive than barley or oats.

The revised Seeds Act restricts the amount of canola seed allowed in red clover. Therefore, red clover should not be planted into canola stubble and neither should canola be used as a nurse crop.

Fertilization

The soil should be tested to determine which nutrients are deficient in the soil. Phosphorus and sulphur are the two main nutrients limiting red clover seed yields. With proper nitrogen fixation, nitrogen fertilizer should not be required. Excess nitrogen fertilization will reduce nodulation and may cause excessive vegetative growth after establishment. If additional phosphorus is required, application at time of seeding is recommended.

Weed control

Since weeds can reduce both the yield and quality of red clover seed, create harvesting problems, as well as add to seed cleaning costs, steps should be taken to control weeds in red clover.

Use pedigreed seed and carefully check the seed testing certificate for weed seed content to avoid seeding troublesome weeds.

In general any agronomic practice that contributes to the quick establishment and maintenance of a vigorous, highly competitive crop stand will help to reduce weed growth.

In red clover stands seeded without a companion crop, mowing at a height just above the seedling clover will control many annual weeds during the year of establishment. A flail-type mower, or one that distributes the plant material evenly over the field, is preferable to a swather. If a swather is used, the canvasses should be removed so that a wind-row is not formed to smother the clover seedlings. Mowing can also be used to control weeds in one-year-old stands that have not developed sufficiently to produce an adequate seed crop.

Red clover, once established, is competitive with most weeds. Where perennial weeds are a problem in an established stand of red clover, hand roguing smaller numbers and either mowing or spot spraying patches with a herbicide, such as Roundup, can be used. Spot spraying will suppress or kill the clover as well.

Herbicides should only be used when needed and to supplement, not replace, good cultural management of weeds. Because red clover is susceptible to injury from most herbicides that control broad-leaved weeds, alternative methods may need to be employed to deal with some problem broad-leaved weeds and thus avoid a yield loss. See *Crop Protection* (the Blue Book), Agdex 606-1 for herbicides registered for use on red clover for seed production and the weeds controlled by these herbicides.

Seedling legumes in the first to the third trifoliolate leaf stages are most resistant to herbicides used for broad-leaved weed control. Seedlings should not be sprayed after reaching 4 in. (10 cm) in height.

Consider options other than using 2,4-D on red clover. The use of 2,4-D, while registered for use on seedling red clover, is not recommended because serious damage to the legume may result. Seedling red clover is more tolerant of MCPA amine up to 0.30 L/acre (500 g/L formulation), especially if it is seeded with a companion crop.

Do not use herbicides that are unregistered for use on red clover. They can cause extensive injury to clover, including underseeded red clover. In research trials, Glean, Lontrel, Ally, Tordon 202C, Blagal, Sencor and Torch DS caused injury to red clover.

Pollination

Red clover must be cross pollinated to produce seed. Cross pollination, the transfer of pollen from the anther of one plant to the stigma of another plant, is done primarily by bees. Cross pollination must occur for seed set because red clover is self sterile; that is, the pollen cannot successfully fertilize pistils on the same plant. Unlike other legumes, the flower structure of red clover provides a greater opportunity for cross pollination after each visit by a pollinator the pistil and stamens move back to their original positions. A second or third visit by an insect will have the same effect as the first one, and the chances of the pistil being properly fertilized will last as long as it remains in a condition to receive pollen.

Bumble bees (*Bombus* spp.) are excellent pollinators of red clover. However, for consistent and reliable seed yields, colonies of honey bees (*Apis mellifera* Linnaeus) must be introduced to seed fields during the blooming period at a rate of one colony per acre.

Alfalfa leafcutter bees (*Megachile rotunda* Fabricius), although known to be capable of pollinating red clover, have not been used successfully on a field scale.

Disease control

Diseases may be caused by fungi, bacteria, viruses, mycoplasma, nematodes and mineral deficiencies or excesses. Of these, fungi are the most important causal factors because they attack foliage, seed coats, and crowns. Preventing or minimizing diseases is more economical than curing them. Crop losses caused by most diseases can be reduced by proper management to maintain a vigorous stand. Use clean seed of recommended cultivars and resistant cultivars where available. Rotate red clover with non-legumes.

Seedling blight – This fungus is responsible for much of the stand reduction in new seedlings. Favorable moisture and temperature conditions can result in heavy fungi build-up and cause heavy losses.

Black stem – Black or dark brown areas develop on stems, leaves and pods. Heavily infested plants may drop their leaves and pods. Cool moist weather favors the disease, so spread is apt to be most extensive during the spring and fall.

Northern anthracnose – This fungus can be destructive to red clover in central and northern Alberta. Early symptoms are water soaked areas on the stem and petioles. Plant parts above the infected area wilt and die. Disease development is favored by cool wet weather. Norlac red clover is resistant to northern anthracnose.

Insect control

Harmful insects

Red clover thrips rasp the plant tissue and suck the plant sap. These tiny red or black insects feed on the flower petals causing brown spots or lesions.

Infestations of thrips are heaviest in fields that are more than two years old. The older the stand, the heavier the infestation is likely to be. Infestations are heavier in dry years. Control measures are not recommended unless there are more than 50 thrips per flower head.

The clover seed chalcid lay eggs inside the young, soft, immature clover seeds. The larvae of this very tiny black wasp develop in the seeds, turn into pupae and emerge from the seeds as adults. In warmer areas of Alberta there are two generations per year. Larvae of the second generation spend the winter inside the seed. Most of the damaged seeds are blown out or caught in the screenings during threshing. The overwintering larvae should be destroyed by burning the screenings and chaff piles in the field. Cutting volunteer plants before they set seed will help to keep the wasp population low.

Lygus bugs are small brown to green-colored insects with sucking-piercing mouthparts. The adults and nymphs feed on the flowers and immature seeds. Damaged seed is shrivelled and has a poorer germination potential than normal seeds. Other pest insects found in red clover seed production areas in North America include the clover aphid, lesser clover leaf weevil, alfalfa looper and grasshoppers.

Beneficial insects

Red clover fields also support beneficial predators that feed on insects pests. Pirate bugs, tiny black and white insects, eat thrips and aphids. The pirate bug nymphs are orange.

Damsel bugs are brown insects which have large front legs like preying mantids. They feed on lygus bugs and aphids. Big-eyed bugs are small brown insects with bulging eyes. They also feed on lygus bugs and aphids. Other aphid predators found in red clover fields include Ladybeetles, green lacewing larvae and hover fly larvae.

Harvesting

Red clover may be either straight combined or swathed and combined.

Swathing can begin when 75 per cent of the heads have turned brown to dark brown. Swath with the prevailing winds. If a chemical defoliant is used, a waiting period of at least one week before swathing or straight combining.

If wind damage is common in the area, swathing should be delayed. In serious wind damage areas, the combine can follow the swather to prevent damage and piling.

Conventional and rotary combines are suitable for harvesting red clover seed. It is important to thresh when the heads are dry. Do not overload the cylinder as it will reduce seed yield. Use sufficient air flow to achieve a clean sample. A concave clearance of 3/32 to 3/16 inch and a cylinder speed of 900 to 1400 rpm are suggested starting points. Many producers find that the cylinder speed for wheat works well for red clover.

Seed moisture should not exceed 12 per cent for safe storage. Always handle seed with clean equipment. Make sure trucks and bins are clean as well.

Post harvest residue management

Do not burn red clover residue as a form of trash removal. Rotary combines will normally chop and spread the residue. If you are using a non-rotary combine you should bale, chop or remove the residue from your field.

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