

Growing Subclover in Oregon

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INTRODUCTION AND HISTORY

SUBCLOVER, *Trifolium subterranean* Linn., also known as subterranean clover, is a winter-annual legume that is well adapted to use in pastures. Subclover is so named because of its habit of burying the developing seed heads in the soil, or beneath the vegetative mat that the plant forms on the surface of the soil. The plant normally starts from seed in the fall. Development during the winter is rather slow. Growth during the spring is very rapid, and by midsummer the seeds have matured and the plants have died. Most plants from spring seedlings live over into the second year.

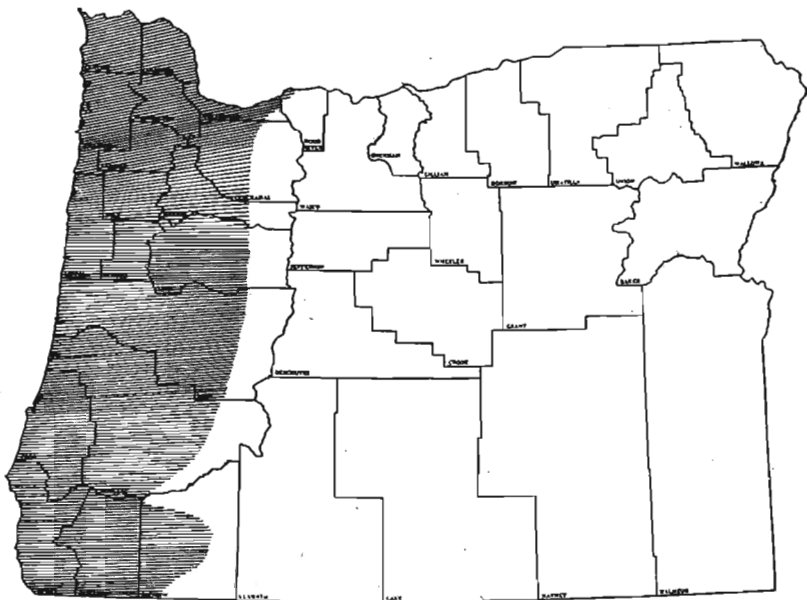


Figure 1. Shaded area on map shows the portion of Oregon where subclover is adapted.

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Subclover is native to the Mediterranean regions of Europe, Asia, and Africa. Its forage value was first recognized in Australia. The plant was introduced into the United States from Australia. The first planting in Oregon was made in 1922 at the Oregon Agricultural Experiment Station at Corvallis with seed supplied by the Division of Forage Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. Subclover did not attract widespread attention in Oregon until 1937 when new Australian strains were tested. Since that time, its use for forage in pastures has increased rapidly in western Oregon. The plant is proving to be of particular value on lands that are too dry or too low in fertility for the persistence of white clover. The first commercial seed harvest in Oregon was in 1941.

ADAPTATIONS IN OREGON

Subclover is adapted to climates having relatively warm, moist winters and dry summers. It is not tolerant of poor drainage. The plant appears to be adapted to that portion of Oregon lying west of the Cascade Mountains as shown in Figure 1. Possible exceptions are the higher, colder elevations and areas in the southern portion that receive less than 20 inches of rainfall annually. Well established subclover seedlings can survive temperatures as low as 10° F. Subclover is naturally suited for growth in combination with grasses which give winter protection to the seedlings. In this association the grasses are stimulated as a result of the excellent soil fertility improving properties of subclover.

Subclover is quite variable in plant types. More than forty different strains have been isolated and recognized. These strains are grouped into three types: early, midseason, and late. The early strains are relatively low in production and are useful in areas of low rainfall where later maturing strains cannot persist. The early strains have shown little value where tested in Oregon. For Oregon conditions, Mt. Barker, a midseason strain, and Tallarook, a medium-late strain, are well adapted, are generally recommended, and are used almost exclusively. In general, the later strains are the highest forage and seed yielders and require the most favorable growing conditions. Subclover, for persistence in pastures, must be early enough to bury and mature sufficient seed for future stands.

THE SEEDBED

When subclover is to be grown for seed, the land selected should be clean. Objectionable weeds are perennials such as wild morning

glory, Canada thistle, and quackgrass, and annual weeds such as hairy vetch, wild vetch, wild pea, wild turnip, corn cockle, cow cockle, dog fennel, and prickly lettuce. The seedbed should be well prepared, firm, and level. This condition favors close cutting which is essential in harvesting a seed crop. If a field is to remain in seed production for more than one year, the land should be reworked each fall in preparation for the next seed crop. The seedbed for spring planting should be fine, firm, and weed-free. This condition favors soil moisture retention during the summer. When planting subclover in the fall for forage purposes, looser, rougher seedbeds are satisfactory. The ash remaining after a fall burn provides good coverage for fall sown seed.

PLANTING SUBCLOVER

Subclover should always be planted in mixtures with adapted, companionable grasses when it is to be used for forage. Growers often establish subclover on old grass sod by broadcasting the seed in the fall without seedbed preparation. A better method of planting without seedbed preparation is to scatter threshed subclover straw over the land and trample it into the soil with livestock. The best method of establishing the clover in mixture with grasses is to plant at the time the grass is planted. When subclover is to be used primarily for seed production, highest yields of seed are obtained when grown alone.

Subclover is naturally adapted to early fall planting. Seeding in September and not later than mid-October is recommended. Plantings made later in the fall may suffer winter injury due to soil heaving. They are also more susceptible to damage by slugs. Spring planting in April, May, or June on well prepared seedbeds is often practiced where soils heave badly by winter frosts.

Subclover is usually planted alone for seed production at rates varying from 6 to 10 pounds of seed per acre. When the crop is to be utilized as forage, the recommended planting rate is 2 to 3 pounds of seed per acre, in combination with grasses. The following mixtures of subclover and grass seeds are recommended for forage plantings in Oregon :*

* These mixtures have been formulated for use under normal prices for seeds. When seeds are high in price, the amount of seed per acre may be reduced, although better results will generally follow the use of the recommended planting rates.

	<i>Pounds per acre</i>
For good western Oregon valley lands :	
Subclover, either Mt. Barker or Tallarook	3
Alta fescue	8
Perennial ryegrass	6
Orchard grass	4
	—
TOTAL SEED	21
For western Oregon hill lands (either cultivated or logged-off and burned) :	
Subclover—Mt. Barker	3
Alta fescue	8
Perennial ryegrass	4
Orchard grass	2
Red fescue	2
Highland bentgrass	1
	—
TOTAL SEED	20
For western Oregon fern lands :	
Subclover—Mt. Barker	3
Alta fescue	8
Common ryegrass	4
Orchard grass	3
Red fescue	2
Highland bentgrass	1
	—
TOTAL SEED	21
For logged-off and burned areas on moist western slope of Coast Range :	
Subclover, either Tallarook or Mt. Barker	3
Alta fescue	6
Perennial ryegrass	4
Red fescue	3
Meadow foxtail	2
	—
TOTAL SEED	18

INOCULATE THE SEED

Subclover develops root nodules with the same nodule bacteria that inoculate white, red, crimson, and alsike clovers. On fields where these common clovers are growing successfully and show healthy nodulation, subclover will generally develop nodules. Where these bacteria are not present in the soil, they must be applied artificially to the seed or distributed in inoculated soil on the area to be planted at the time of planting. The inoculant for subclover prepared by the Department of Bacteriology, Oregon Agricultural Experiment Station, is a strain that is believed to be especially adapted to this legume. Threshed subclover straw and heads from the cur-

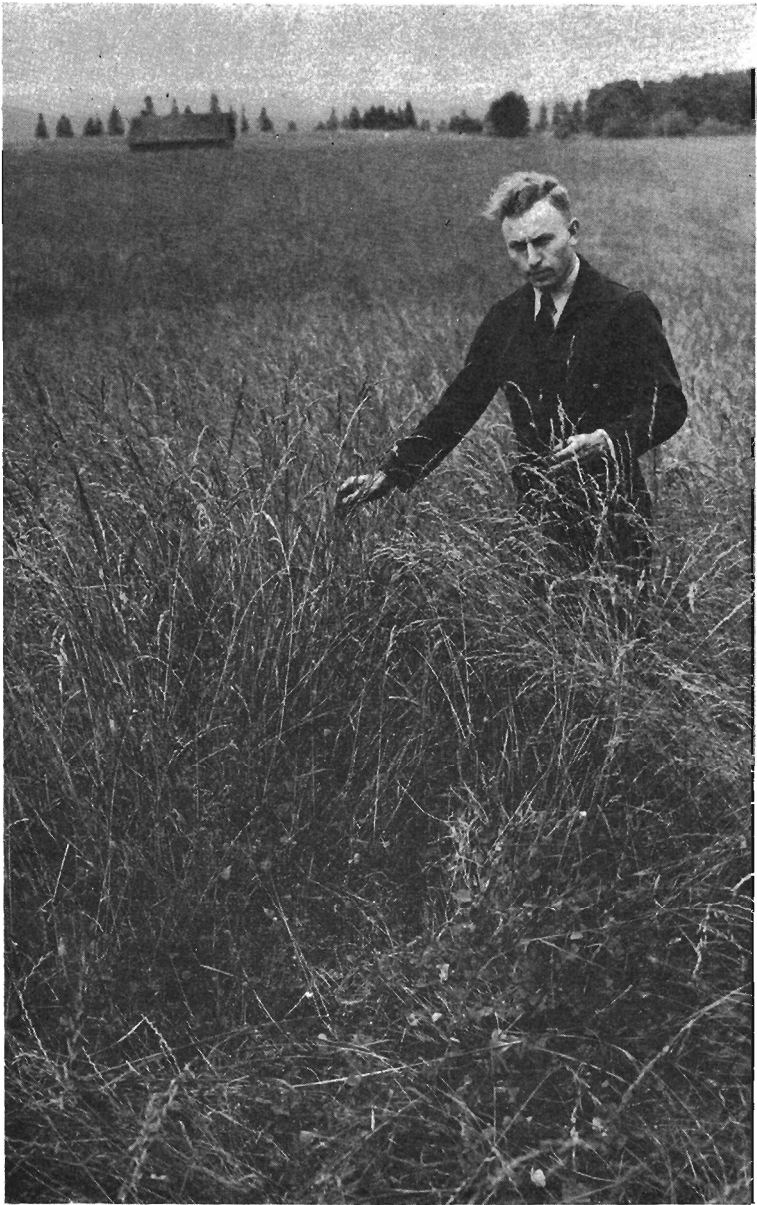


Figure 2. Subclover and Alta fescue grow well together.

rent year's crop will carry the bacteria to fields over which it may be scattered.

METHODS OF PLANTING

Subclover seed may be planted by broadcasting followed by harrowing-in where possible and by drilling. The most uniform stands are usually obtained by drilling. This method is especially recommended for planting on well-prepared seedbeds. The seed should not be covered deeper than one inch.

UTILIZATION AND MANAGEMENT

Subclover is relished by all kinds of livestock. It is best adapted for use as a pasture plant when grown in mixture with adapted companion grasses. It is also suited to use as silage or hay. The plant has persisted under very close grazing since 1930 in Oregon.

The season of green forage production of subclover in Oregon is usually from late March to mid-July. Its beneficial effect on companion grasses, however, is perceptible throughout the year. The following table shows hay and silage yields of perennial ryegrass grown with and without subclover on the Oregon Agricultural Experiment Station:

Crop	Forage weights per acre			
	Silage 1941	Silage 1942	Hay 1943	Hay 1944
Mt. Barker subclover and perennial ryegrass	<i>Tons</i> 7.77	<i>Tons</i> 8.53	<i>Tons</i> 2.36	<i>Tons</i> 2.26
Perennial ryegrass alone, no fertilizer	2.10	1.76	1.05	1.12

After the plants have matured, the unburied seed heads on the surface of the soil are eaten eagerly by sheep and cattle. During dry years, when most of the seed may mature unburied, careful pasturing is advisable to avoid too heavy consumption of the heads and consequent reduction of seed for the following year's crop.

Subclover requires fertilization to maintain high production of forage and seed. A general recommendation for western Oregon is a yearly application of superphosphate (16 per cent) at 200 to 300 pounds per acre, or gypsum and treble phosphate (45 per cent) at 100 to 150 pounds of each per acre in early March. Seedling growth may be encouraged on phosphate deficient soils by applying the phosphate fertilizer in the fall. Lime applied at 1 to 2 tons per acre may be beneficial on the more acid hill soils.



Figure 3. Subclover grown alone for seed production.

Good management is essential to the maintenance of a balance between subclover and grasses in pastures. Very close grazing may cause the clover to increase at the expense of the grasses. Tall-growing, vigorous grasses, such as Alta fescue, if allowed to make considerable growth, may reduce excessive amounts of subclover in pastures. Dense-sodded grasses, such as red fescue and chewings fescue, tend to prevent domination by subclover. Sometimes, under conditions that are especially favorable for clover, it may be necessary to reduce the amounts of legume stimulating fertilizers applied, or omit them entirely when other methods of management do not prevent domination of the grasses by the clover.

HARVESTING THE SEED CROP

Subclover seed is ready to harvest when the plants are dead and thoroughly dry. This time is usually in late July or in August, depending on the strain grown and the season.

The most satisfactory equipment for harvesting a heavy crop is a tractor-driven, power take-off mower equipped with a lespedeza cutter bar and windrower. This bar clips closer to the soil surface than the standard mower bar. Where the mat of clover vines is especially dense and heavy, pea lifter guards that attach over the upper surface of the bar should be used. Lifter guards that are attached underneath the bar cause higher clipping than is desirable. A five-foot cutter bar, because of less side-draft, is preferable to a longer bar for cutting vigorous, heavily producing strains such as Tallarook. When cutting the crop, the bar should be tilted forward and the tractor operated in low gear to give the mower knife plenty of speed. This prevents pulling of the vines and clogging. Where the power take-off mower is not used, the tractor should be operated at a higher speed.

Another harvesting method that requires no special equipment consists of mowing above the seed heads with a standard mower and windrower, to clip off weeds, grasses and excess clover straw which is removed and may be used for feed. The field is then raked with a strong hay rake. The runners and heads thus pulled up are dropped into windrows. The rake teeth should be of the heavy type for best results. This method is successful only when the clover plants are thoroughly dry and break off easily at the surface of the soil.

After the seed crop has been removed from the field, some un-gathered heads always remain on the soil surface. Some success has been achieved in gathering these heads with specially constructed "vacuum cleaner" machines.

The seed crop is usually threshed with standard stationary threshers. Some growers thresh direct from the windrows with combine harvesters. The toothed cylinder machine is reputed to be superior to the rub-bar type for this purpose.

Warm, dry weather is essential for efficient threshing. Re-threshing of the straw is often worthwhile as the seeds are rather difficult to separate from the heads and pods.



Figure 4. A heavy set of subclover seed heads exposed by lifting the plants.

USE THE THRESHED STRAW ON PASTURES

Threshed subclover straw almost always contains considerable amounts of heads in which seeds remain. This straw is valuable for scattering over established pastures and hill ranges on which stands of subclover are desired.

DISEASES

Stem rot, when present, causes rapid dying of infected plants and is most active on subclover in late winter and early spring. The disease is seldom destructive, however, although very thick stands may be affected in patches. No effective control measures are known. The disease is most severe on land that is frequently cropped to legumes.

Mosaic, a virus disease spread by aphids, is most prevalent during years when these insects are numerous. The effects on subclover are: stunting of the plants and crinkling, mottling, and yellow streaking of the leaves. No serious outbreaks of mosaic have been reported.

INSECT PESTS

The principal insect pests of subclover in Oregon are the common garden slug and the eleven-spotted cucumber beetle. Slugs are generally most destructive to the young seedlings of fall plantings. They can be controlled by applications of commercially prepared poison bait pellets containing metaldehyde and arsenic. The eleven-spotted cucumber beetle is destructive to the seedlings of spring plantings. No effective control method is known.

ANIMAL PESTS

Gopher, mole, and digger squirrel mounds are particularly troublesome, because they interfere with the mowing and raking operations of subclover during the seed harvest. Gophers destroy many plants. Field mice inhabit the abandoned tunnels of gophers, moles, and squirrels and consume the clover seeds and seedling plants. Moles can be controlled by trapping. Gophers are controlled by trapping, poisoning, and gassing. Digger squirrels are easily destroyed by poison baits. Field mice can be controlled by poisoning and by excluding gophers, moles, and squirrels from the clover fields. Methods of control for these animal pests are described in Oregon State College Extension Bulletin 335.