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Strawberry CLOVER

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STRAWBERRY CLOVER

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Strawberry clover (*Trifolium fragiferum*), one of the more recent clover emigrants, promises to play an important role in the reclamation of seeped, saline, and alkaline soils, now considered as waste lands in the Western States. The growth of this clover is not limited to salty conditions, as it will thrive on low, wet, nonsaline soils as well and will tolerate flooding for considerable periods.

This clover is a perennial, low-growing, pasture legume spreading vegetatively by creeping stems that root at the nodes. The leaves, stems, and habit of growth are somewhat similar to white clover, making it generally difficult to distinguish, when not in bloom, from certain types of white clover. The flower heads, seed pods, and seed are very distinctive, however, making identification easy (fig. 1). In general the flower heads are round, although sometimes they are slightly pointed, and in color they are mostly pink to white, resembling a strawberry, from which fact the common name is derived.

As the seed matures the calyx around each seed becomes inflated, appearing like miniature balloon capsules, and shades from gray to light brown in color. When ripe, these capsules break off from the head and readily float in water or may be blown by the wind. The seed color varies but to the eye is principally reddish brown or yellow flecked with dark markings. Most samples contain a few seeds without markings. The seed is much larger than that of white clover but slightly smaller than red clover seed.

Strawberry clover is palatable and is relished by all classes of livestock and poultry, but it seldom grows tall enough to harvest for hay. The tolerance of strawberry clover to seeped, saline, and alkaline soils containing concentrations of salts that inhibit the growth of most other crop plants is of particular importance.

Origin

Strawberry clover is native to the eastern Mediterranean and southern Asia Minor countries, but it has been widely and inadvertently spread by man. It has been observed in every continent of the world; and wherever it is grown, the value of the pasture herbage has increased. In Australia its culture on low-lying overflow lands has become extensive.

How and when strawberry clover was first introduced into the western part of the United States is a matter of conjecture. Plant specimens were collected near Philadelphia, Pa., as early as 1878. Seed was brought into this country as early as 1900, but available records do not indicate that it was tested under conditions where it now appears to have a definite place. In many places it has been found growing after the land had been seeded to Australian grasses and saltbush, and it has been assumed that the clover seed was mixed

with the other plant seed. Because of its palatability, scattered plants are usually closely grazed, and thus seed production is limited. In many places the spread of occasional plants has been mostly by means of the creeping stems. With the development of interest in this clover, large and small areas of it have been discovered in all of

FIGURE 1.—Leaf, seed head, shattered seed envelopes (inflated calyx), and seed of strawberry clover. About normal size. (Courtesy of the Washington Agricultural Experiment Station.)

the Northwestern States. These plantings range from a fraction of an acre to fields of over 40 acres. Several of these plantings have been known for 30 years or more.

Range of Adaptation

Strawberry clover is adapted to a wide range of conditions, having been established successfully in most of the Western States. The plant, however, is of particular value on wet saline or alkaline soils,

although it will thrive in normal soils. The degree of tolerance to high concentration of salts is influenced by temperature, moisture content of the soil, and kind, quantity, and dispersion of salts present. Since one or more of the above conditions may vary widely within a short period, it is impossible to state any definite degree of salt concentration that this clover will tolerate. Strawberry clover has been observed making a good growth in association with saltgrass and salt sedges in locations where the salt content of the soil was more than 1 percent. In established stands plants have survived salt concentra-

FIGURE 2.—A field of strawberry clover. Water stood over this area for 2 months in the fall without injuring the plants.

tion of over 3 percent for long periods during both winter and summer months. Under such concentrations, however, but little growth is made. After the salt concentration is reduced, which may be brought about by flooding, and conditions again become favorable, the plants renew growth. Limited studies have indicated that strawberry clover is more tolerant of soils containing chlorides or sulfates than carbonates or bicarbonates. Experiments have shown that the salt tolerance of seedling plants is greater under cool temperatures than under warm temperatures.

In general, strawberry clover will make its best growth in wet to moist soils, and its favorable adaptation to such conditions makes it extremely valuable for large areas in most irrigation projects, where drainage is a limiting factor in crop production. Another valuable characteristic is its ability to survive flooding for 1 to 2 months without the plants being killed (fig. 2). Although it will live under relatively dry conditions and will survive short periods of drought,

the clover will not make sufficient growth to warrant its use on dry lands.

Strawberry clover thrives under wide extremes of temperatures ranging from 40° below zero to high summer temperatures, except Shearman's clover, a sparse seed-producing variety of strawberry clover, which is easily winter-killed and seems to thrive better under uniform temperature and growing conditions.

Strawberry clover has been tested in various places in the Eastern States, and, although good growth has been secured in test plantings, it has not appeared to be capable of competing with white clover under conditions favorable to the latter. Strawberry clover should be more widely tested in low-lying areas and in soils frequently flooded with brackish water. It is believed that where the tall-growing, competing vegetation is kept cut until the clover is well established better success would be obtained. In addition to eliminating the competing vegetation it may be necessary to apply lime and to fertilize with phosphate fertilizers in order to get good stands and growth.

Seedbed Preparation

Preliminary studies to determine the best methods for seedbed preparations and methods of seeding indicate that where possible a seedbed should be prepared in the fall by plowing or disking thoroughly, followed by harrowing to level and firm the soil. This preparation temporarily destroys the vegetation occupying the land and reduces competition. In places where the soil remains too wet for working the seedbed the vegetation should be mowed and removed in the fall. This should be followed by late winter planting of unhulled seed or early spring planting of scarified seed.

Seeding should be done early in the spring on a firm, moist seedbed, since the establishment of strawberry clover seedlings appears to be somewhat slower than that of red or white clover. The seed may either be broadcast or drilled in very shallowly. Although good stands have been established by using 2 pounds of seed per acre, a heavier rate up to 5 pounds an acre is more desirable, and this is particularly true if a thick stand is desired the first year. The present price of seed, however, may limit the practice of seeding at the higher rates. Fortunately, this clover spreads rapidly by the creeping stems, and originally thin stands may become thick by the end of the second year, particularly if growing conditions are favorable. On nonsaline soils strawberry clover may be spring seeded with a companion grain crop, if an ample supply of moisture is available throughout the season.

Care After Seeding

If the seedlings are made on a prepared seedbed, it is not often that the other vegetation will crowd out the seedlings and prevent their establishment. When the seed is broadcast, however, without seedbed preparation, rushes and sedges are very apt to crowd out the seedlings. Mowing to reduce this competition is, therefore, highly desirable and should be done when necessary. After the seedling plants are well established the areas may be grazed. Grazing is very desirable for two reasons: (1) The grass and sedges are grazed with the grazing of the clover, which reduces the competition to the

benefit of the clover, and (2) the sedges and rushes are trampled, which also retards their growth, giving the clover more opportunity to spread. When strawberry clover is planted with other grasses and legumes in normal soils it may be grazed at the same time as other pasture plants.

Utilization

Strawberry clover is principally a pasture plant, though it may be used as a green-manure crop, particularly on soils where salinity prevents the growth of other legumes. It is very palatable and is as rich in animal feed units as white clover. When the plants are grown on saline soils the composition of the vegetation is somewhat higher in minerals than when they are grown on salt-free soils, but all available reports have indicated that animals have not been injuriously affected from grazing it. Like other legumes, strawberry clover may cause animals to bloat and necessary preventative measures should be taken. All types of animals and poultry have grazed strawberry clover with good results. Strawberry clover will survive under close grazing similar to the low-growing forms of white clover, but it may be more productive if grazed moderately. Close grazing, on the other hand, will reduce the number of many of the other less desirable plants and in that way will encourage the spread of the clover and the development of a good pasture turf. It has been grazed continuously from early spring until late in the fall without affecting the stand, although rotational grazing would probably favor greater production. With an increase of the salt concentration of the soil to the point where growth is inhibited the advisable practice is to remove the animals until the clover makes additional growth. Close grazing in late fall is not recommended, as such a practice may result in partial killing of the stand during the winter months.

Farmers who have used large acreages for grazing claim that on similar soils the carrying capacity of strawberry clover is far superior to that of other pastures. Many claim that 1 acre will carry from one to two cattle through the entire growing season provided growing conditions are favorable.

The blossoms of strawberry clover are visited by honeybees. Apparently they obtain considerable nectar, which indicates that this is a good honey plant.

Seed Production

Strawberry clover is a prolific seed-producing plant if properly handled. Yields range from 40 to 300 pounds of seed an acre, and higher yields in exceptional cases have been reported, although the production of 100 pounds of seed an acre is more common.

The flowers of strawberry clover are self-fertile, that is, seed will form without cross-pollination, which is necessary with red clover and white clover. Honeybee visitations from flower to flower, however, are of assistance in insuring a movement of the pollen to the stigma. Placing of colonies of honeybees immediately adjacent to blossoming fields is suggested as a means of increasing seed yields.

The blooming period of strawberry clover usually begins from 2 to 3 weeks later than white clover, and its flowering is completed earlier in the summer. Under most conditions strawberry clover does not bloom until the first year after seeding, and thick stands appear to

bloom more profusely than thin ones. Thin stands and unfavorable growth conditions have a tendency to encourage the formation of short-stalked seed heads that make seed harvesting difficult.

FIGURE 3.—Portion of a field of maturing strawberry clover growing in association with sedge. (Courtesy of the Colorado Agricultural Experiment Station.)

Since the flowering and growth habits of strawberry clover and white clover are similar the same methods may be followed in seed harvesting. Where strawberry clover is grown on an uneven soil surface, harvesting has been done by hand-picking, which limits the amount and increases the price of the seed. Rough, hummocky soils

supporting a thick stand of clover have been disked, harrowed, and rolled early in the spring without doing serious damage to the stand, and this practice has enabled the seed to be cut with a horse-drawn mower.

Several farmers have followed the practice of grazing the clover until the first of June, when the animals are removed. This permits additional growth to be made, followed by blooming and seed formation. They claim that this practice reduces the amount of weed growth, which often handicaps seed-harvesting operations and reduces seed yields.

The seed crop should be cut when the majority of the seed capsules or envelopes are light brown in color (fig. 3). An examination of the maturing seed is recommended to see whether it is ripe. If cut too early, the seed will be shrunken and immature. Close grazing up to the time of blooming will not prevent blooming and seed production, but the heads will form close to the soil and can only be harvested by hand-picking. When the clover is grown in soils strongly saline preceding and during the blooming period, the heads are also short-stalked and cannot be cut with a mower.

Because the heads of strawberry clover shatter readily when ripe, it is advisable to cut and handle the crop when the heads are slightly damp, as then the seed envelopes will be tough.

The crop may be harvested with a mower and later picked up from the swath or windrow. The use of mowing machines equipped with windrowing attachments and bunchers closely set reduces the number of times that the crop must be handled and in turn the possibility of excessive shattering. Harvesting by means of vacuum machines has been unsuccessful.

The seed crop may be cured in and threshed from the windrow or stack by clover hullers, grain separators, or combines equipped with hulling attachments. The seed coats of strawberry clover seed are hard; even after hulling, as much as 40 to 75 percent of the seed often remains hard. Such seed should be scarified before being sown, to obtain more complete germination.