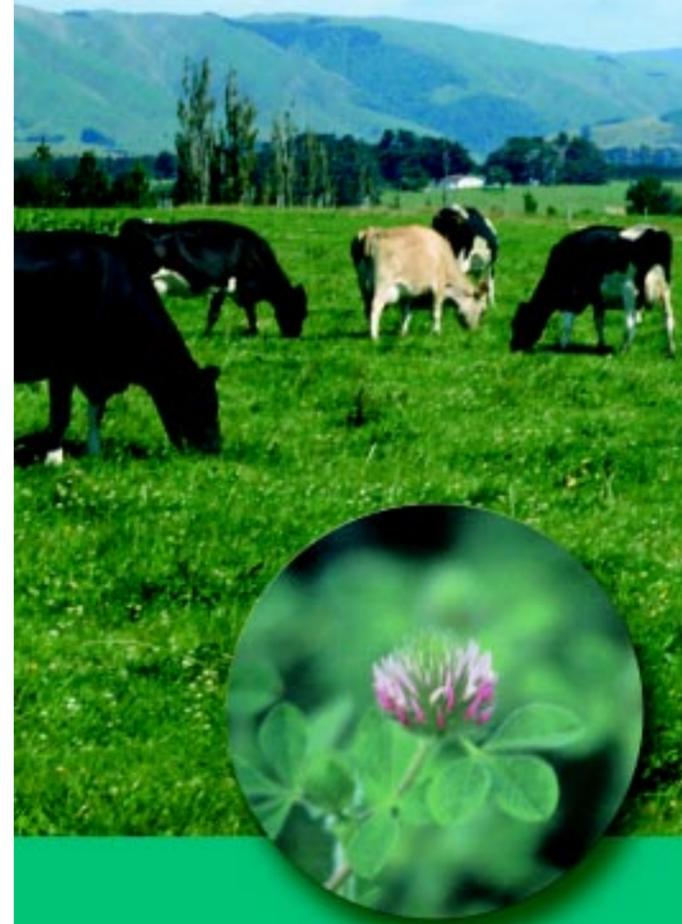


Clover Selection Guidelines:

Matching Species Traits To The Situation



Clovers are wonderful plants that can contribute greatly to forage/livestock programs, to soil stabilization, and in other situations in which plant vegetation is desired. Benefits clovers can provide include improved forage quality, increased forage yield, biological nitrogen fixation, extension of the growing season, soil improvement, and land beautification.

However, the characteristics of clover species differ. Some are more tolerant of certain climatic conditions, soil conditions, and/or management regimes than others. Furthermore, clovers may also differ with regard to the particular benefits they provide (for example, if forage growth is desired at a specific time, one clover may be a much better choice than another).

Consequently, when planting decisions are made it is important to have in mind the traits of various clovers and then take care to select the one(s) best suited to the situation. This publication provides general information regarding a number of points that should be considered when deciding which clovers to plant.

NOTE: This publication provides general information which applies in most cases. However, climatic, management, or other factors may result in exceptions.

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Annuals Versus Perennials

Annual clovers complete their life cycles within one year (i.e., plants emerge from seed, grow, produce seed, and die, all within a 12 month period). Annual clovers reproduce only from seed and not by vegetative propagation from roots or other plant structures.

If a stand of an annual clover is present in an area for more than one year without being replanted, it is due either to reseeding or delayed germination of previously planted seed. All annual plants present at any given time will die within a 12 month period.

In the case of many annual clovers, much of the seed produced in spring or early summer will germinate in the autumn of that year, but some may lie dormant until subsequent years. Delayed germination is due to "hard seed" which have a seed coat that must be broken down over time to allow water to enter the seed. The percentage of hard seed produced varies depending mainly on the clover species and variety, but environmental conditions also have an influence.

Perennial clovers also make seed, but (assuming environmental conditions and management are appropriate) individual plants can live more than one year. Thus, a stand of a perennial clover may contain recently established plants that are less than a year old as well as plants that are more than a year old.

In most situations in which clover is to be grown with a perennial grass, it is preferable to use a perennial clover (if adapted) rather than an annual clover. The reason is that annual clovers, which must come from seed each year, have more difficulty becoming established due to competition from grasses and other plants (especially perennial plants)

than do perennial clovers which already have a good root system established.

In addition, the autumn forage growth of established perennial clovers is better than that of recently germinated annual clovers. However, in many areas in the South, perennial clovers will not survive the heat and drought of summer, and first-year growth of a perennial clover is normally less than that of annual clovers. Thus, there are situations in which use of an annual clover with perennial grass is preferable. This is especially true with warm season grasses being grown on droughty soils.

Geographic Adaptation/ Time Of Planting

There is some use of annual clovers in winter rainfall areas of California and Oregon, but most plantings of the commonly used annual clovers (arrowleaf clover, ball clover, berseem clover, crimson clover, rose clover, and subterranean clover) in the United States are made in the South (Figure 1).

In these areas, most prepared-seedbed plantings are made in autumn 4 to 6 weeks before the date of the first killing frost. When seeded into warm season grasses, they are normally planted near the expected date of the first killing frost.

Autumn-planted annual clovers are often grown in mixtures with annual ryegrass and/or small grain (usually rye, wheat, or oats) which provide more autumn and winter production,

Annual clovers are not widely used in the northern United States, but some acreage of a few species is spring-planted in this area.

The most commonly used perennial clovers in the United States are white clover and red clover. These clovers can be grown throughout much of the nation (especially in the Midwest, Northeast, and Northwest) in areas in which there is a suitable soil pH, adequate fertility, and good soil moisture during most of the year. They can be established either in autumn or spring in many areas, with most plantings in the northern United States being made in spring, and a higher percentage of autumn plantings occurring the farther south one goes.

White clover and red clover are most commonly grown in combination with cool season perennial grasses such as tall fescue, orchardgrass, timothy, or smooth bromegrass. However, in the Southeast they can be a companion to certain warm season perennial grasses on sites that offer good moisture availability during much of the growing season.

Annual Clovers



Other Points To Consider

Soil conditions, expected climatic conditions, and grower objectives are important factors influencing which clovers will be the correct one(s) to plant in a particular situation. The following brief descriptions of various commonly grown clovers, together with the information in Table 1 can provide much insight regarding species suitability for various situations.

PERENNIALS

White Clover



White clover, a true perennial, is the most widely-grown clover in the United States. Where adapted, individual plants often live for several years. Ladino varieties of white clover are usually most productive, but generally do not reseed well. Intermediate white clover types are better reseeder and more persistent, but usually are less productive. White clover is tolerant of close grazing, which makes it a good choice for many pastures, but it is not well-suited for hay situations. Though widely adapted, it is best suited to soils which have good moisture-holding ability.

Red Clover



Red clover has excellent seedling vigor and larger seed than white clover, which facilitates drilling it into existing grass pastures. In many areas red clover plants can live for 2 years (and occasionally longer), but in the lower South it often acts as an annual. In areas where it is well adapted, it is the best-yielding clover species. It is often grazed, but is also well suited for use in hay situations. It is not tolerant of continuous close defoliation; rotational stocking is best. Red clover requires good soil moisture, but is not as tolerant of wet conditions as white clover.

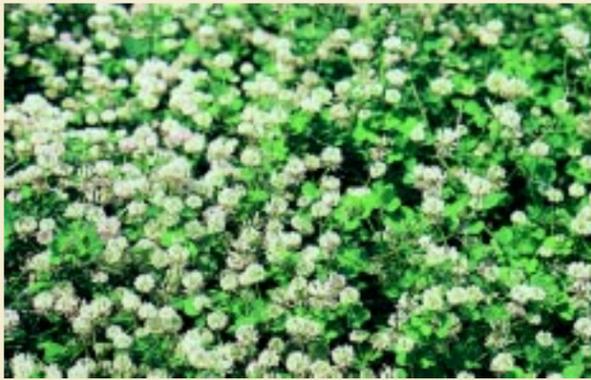
ANNUALS

Arrowleaf Clover



Arrowleaf clover is a productive annual that makes most of its growth in late spring. It produces a high percentage of hard seed, which favors reseeding. The seed can germinate at lower temperatures than most annuals. It is usually grown in pastures, but can also be cut for hay (one cutting only). Arrowleaf/grass mixtures should be grazed enough to prevent the clover seedlings from being shaded by the grass. Arrowleaf clover requires well-drained soil.

Ball Clover



This winter annual is sometimes mistaken for white clover, but the blooms are smaller and more rounded. Although it can be quite productive, ball clover has a shorter growing season and often yields less than other commonly grown annual clovers. It is a prolific seed producer even under high stocking rates, and a high percentage of the seed are hard seed. Thus, it is an excellent reseeder. The primary period of growth is early to mid-spring. Ball clover is best suited to heavy soils, but is surprisingly well adapted to fairly dry sites as well.

Berseem Clover



Berseem clover is an annual which bears a superficial resemblance to alfalfa. If planted in autumn, most growth occurs in mid-spring. Within 100 miles of the Gulf Coast it often produces more autumn and winter forage than any other clover, but because it does not have good cold tolerance, production declines as it is planted farther north. Rotational stocking is the best way to utilize berseem clover pastures. This clover does not reseed well due to a low level of hard seed production. Unlike most commonly grown annual clovers, berseem clover is quite tolerant of wet soils and also alkaline soils.

Crimson Clover



Crimson clover is a dependable, productive annual which has larger seed and better seedling vigor than most clovers. Crimson clover makes more growth during cool weather than most clovers and is the earliest-maturing commonly grown clover species. Thus, in addition to forage production situations, it is often used as a winter cover and/or green manure crop. The showy crimson-colored blooms can provide a spectacular show in early to mid-spring. This clover should be planted on well-drained soils.

Rose Clover



Rose clover has a growth habit similar to crimson clover, but has lavender-colored blooms and makes most of its growth in mid-spring. It is one of the most tolerant clovers to drought and low fertility conditions. The most hardy variety has similar winter hardiness to arrowleaf clover or crimson clover, but varieties often grown in western states are much less cold tolerant. Rose clover produces many hard seeds, and reseeding is often good. It is best suited to well-drained soils, and is most popular in certain low rainfall areas of central Oklahoma, north central Texas, and California.

Subterranean Clover



Subterranean clover is a dense, low-growing annual best suited to areas having mild winters. It makes most of its growth in mid-spring. Subterranean clover does not yield as well as arrowleaf clover, berseem clover, or crimson clover, but can produce seed under heavy grazing pressure. However, success in obtaining reseeded stands varies depending on environmental conditions at seed maturation. Subterranean clover is more tolerant of low fertility and shade than most clovers. It is best adapted to medium and heavy textured soils with good moisture-holding capacity.

Final Thoughts

A good way to determine the usefulness of various clovers in a given situation is to simply purchase some seed and make trial plantings. Small test plantings are inexpensive and can provide much insight that can help with species selection decisions in future years.

However, it is important to make certain that any such test plantings give the clovers a fair chance. The soil pH and fertility needs of the clovers should be met, the seed should be inoculated with good quality inoculum of the proper type, and the seed should be planted properly at the recommended time, rate, and depth.

Varieties within a clover species can vary considerably with regard to yield, disease resistance, winterhardiness, and other factors. Thus, once a decision has been made as to which clover species to plant, selection of the most suitable variety can mean the difference between good and poor results. University variety trial reports are the best sources of unbiased variety information.

Characteristics of Clovers Commonly Grown in the United States

PERENNIAL CLOVERS	Annual or Perennial ¹	pH Range for Best Growth	Seedling Vigor ²	TOLERANCE TO				BLOAT POTENTIAL ³	Normal Seeding Rate (lb/ac)
				Poor Drainage ²	Drought ²	Grazing ²	Acidity ²		
Red	P	6.0-6.5	E	F	G	G	F	L	8-15
White	P	6.0-7.0	F	G	F	E	F	M	2-3
ANNUAL CLOVERS									
Arrowleaf	A	6.0-6.5	F	P	G	G	F	L	5-10
Ball	A	5.8-6.5	P	G	G	E	F	M	2-3
Berseem	A	6.5-7.5	G	E	F	F	P	L	10-20
Crimson	A	6.0-7.0	E	P	F	F	G	L	20-30
Rose	A	6.0-6.5	P	P	G	G	G	L	15-20
Subterranean	A	6.0-7.0	G	G	F	E	G	L	10-20

¹ P=Perennial; A=Annual

² E=Excellent; G=Good; F=Fair; P=Poor

³ L=Low; M=Medium; H=High