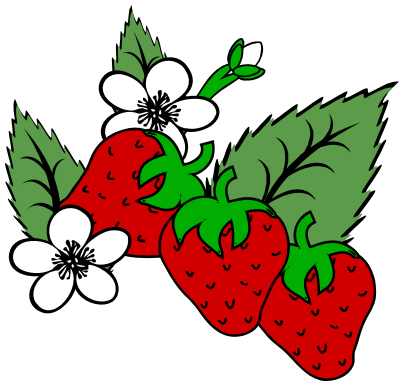
PREPLANT COVER CROPS FOR STRAWBERRIES



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Seeding a cover crop on a site one or two years before planting strawberries is an excellent way to improve soil structure, suppress weeds, and if the proper cover crop is grown, suppress nematode populations. Recent research has shown that certain cover crops can kill disease organisms as well. Maintaining high levels of organic matter in the soil improves tilth and helps maintain a flourishing microbial community that can suppress pathogen development. Benefits of a cover crop are greatest when the soil is sandy and/or the soil organic matter content is low.

Introduction

Most cover crops grow under the same soil conditions as strawberries. Except for additional nitrogen (40 lb/A prior to seeding) and perhaps phosphorus, other amendments are not likely to be required for traditional cover crops. Although the optimal pH for most cover crops is 6 - 7, most grasses will grow satisfactorily at a soil pH of 4.5 or higher. Minimum seeding rates are used when the objective is to supply an acceptable stand for harvesting the grain or straw. But when a vigorous, dense stand is desired for weed suppression and organic matter, higher seeding rates are recommended. Small grains or seed from clover or buckwheat cover crops can be harvested and sold to recoup establishment costs. Seeds from native plant cover crops, such as prairie plants, have high value and may be considered as an income source if managed and harvested properly.

Most cover crops require only light incorporation and packing. Irrigate, as soon after planting as possible in order to promote germination. If irrigation is postponed, weed seeds may germinate and out-compete the desirable cover crop.

Many preplant cover crops are plowed under in the late fall or early spring prior to planting. Those with low nitrogen contents (grains and grasses) should be plowed under early in the fall to allow adequate time for decomposition, unless the soil and site are prone to erosion. Legumes contain more nitrogen and decompose quickly, so they can be turned under within a month of planting. Obviously, certain crops like buckwheat or hairy vetch can be incorporated in summer to allow the seeding of a second crop for fall.

Many plant species are suitable as preplant cover crops, and each has certain advantages. In some cases, mixtures of crops are used to realize the benefits of both. The following are a variety of cover crops that perform well in cooler climates, but the list is by no means comprehensive.

Selecting a cover crop

The selection of a cover crop should depend upon several conditions: 1) time of year when a cover crop is desired, 2) the crop to follow, 3) pH and soil fertility, 4) available tillage equipment, 5) the length of time the crop will be allowed to grow, and 6) primary purpose of the cover crop (increasing soil organic matter, reducing weed populations, or controlling pests, such as interrupting the life cycle of diseases, insects, or nematodes).

Buckwheat. This crop is a useful preplant cover on a site with a low soil pH. While the top portion of the plant grows quickly, there is little organic matter contribution from the roots. Reseeding will occur readily if plants are allowed to go to seed, so incorporate shortly after flowering. Earlier seeding in late May or early June is superior to summer seeding in late July.

Annual Field Brome. This is a fast establishing winter annual grass that has a much more extensive and fibrous root system than most other green manure crops. Seeding made during July and August tend to be much more successful than seeding made in late the spring. The following year's spring growth is rapid and after the seed ripens in July, the crop will die. If the soil is disked when the seeds start to fall, then the crop can be reestablished easily with no further seeding. Plan to thoroughly disk or plow down this heavy root system early in the spring. This seed is not readily available so plans for obtaining it should be made well in advance of the normal seeding date. Annual field brome is usually seeded at a rate of 20 pounds per acre.

Japanese Millet. This is a fast growing summer annual, which will compete well with weeds and will establish faster on cooler soils than sudangrass. Planted from late May to mid-July, this plant will achieve a height of four feet in seven or eight weeks. Unlike small seeded legumes and grasses, the seed of millet should be covered from 3/10 to 1 inch deep in a firm seedbed. The planting may be cut back and allowed to regrow at any time after twenty inches of growth is obtained. Millet should not be allowed to mature and drop seed. The seed of millet is relatively inexpensive; at a seeding rate of 20 pounds per acre the cost of seed is approximately $7.00.

Spring Oats. When used as a very early spring green manure crop, oats should be planted in early to mid-April. Because of the fast spring growth, plan to incorporate in early to mid-June. Oats will grow on soils of relatively low soil pH (5.5) and with moderately good fertility; however, this crop requires good soil drainage. A mid-August seeding will provide good growth and ground cover for protection against soil erosion during the fall and winter months. Oats will be gradually killed back by successive frosts and will not grow again in the spring.

The dead plant residue is easily incorporated with very light tillage equipment. Three bushels of oats are usually planted (approximately 100 pounds) at a seed cost of $17.00 per acre.

Annual Ryegrass. Seedings establish very rapidly in spring or late summer. Ideal dates for spring seedings range from early April to early June and late summer seedings are more successful when made from early August to early September. The heavy root growth and the rapid seeding development make annual ryegrass a very desirable green manure cover crop in areas where good soil-water relations can be maintained. The ryegrass will die out early in the second year leaving a heavy root system and a moderate top growth residue to incorporate into the soil. A seeding rate of 30 pounds per acre is suggested, at an approximate cost of $15.00.

Sudangrass. This is a summer annual that requires heat for good growth. Seedings made in late May or early June will guarantee a more vigorous growth than seedings made in late June or early July. Hybrid sudangrasses may have larger seeds and should be planted at heavy rates. Like millet and sorghum-sudan hybrids, which have large seeds, sudangrass should be seeded to a depth of one half to one inch into a firm seedbed. Similarly, this summer annual will recover following removal of the top. Due to the tall habit, the crop should be cut back when growth exceeds 20-25 inches or plowed down if a second growth is not desired.

Sorghum-sudangrass hybrids. This summer annual requires more heat for growth than sudangrass. It is more expensive to establish and fails to adapt to most soils as readily as Japanese millet. This crop will grow to a greater size than sudangrass under ideal conditions of heat, moisture, and fertility, but the 4-6 foot growth is very difficult to incorporate with small or moderate sized tillage equipment. Like sudangrass, this crop will make a second growth if climatic conditions will permit. Growth will cease by mid-September in years when night temperatures drop to near freezing. The seeding rate will vary from 35-50 pounds depending upon the size of the seed; therefore, the cost of seed can range from $20.00-30.00 per acre.

Winter Rye. This cereal grain establishes fast from late summer and early fall seedings, even on low pH soils. Fall seedings made after October 1 are likely to provide only winter cover and are slower to produce heavy spring growth. Excessive early spring top growth can create tillage problems if the crop is not incorporated by early to mid-May. This date will vary with the location and season. The seed is readily available at a cost of $20.00 for the 100 pound seeding rate. Seed is often sold in bushel quantities of 56 pounds.
Clovers. Several types of clovers are suitable as preplant cover crops: alsike, ladino, white, red and sweet clover. They contribute a significant amount of nitrogen when incorporated prior to planting raspberries. Clovers grow best at a soil pH of 6.0 - 7.5, with a high phosphorus content. If clovers have not grown in the field previously, the seeds may require an inoculant. Establishment is best

when seeding occurs from early April to mid May, although early August seedings can be successful. Seeding rates are as follows (lb/A): alsike (4 lb/A), ladino (2), white (2), red (8) and sweet (12).

Hairy vetch. This legume is adapted to a range of soil conditions and is a moderately fast growing winter annual, providing up to 125 lb/A nitrogen for the next crop. Hairy vetch is seeded at 40 lb/A in early August. It overwinters and flowers in May. Hairy vetch should be incorporated before the flowers produce viable seeds or else a weed problem could result in the subsequent crop.

Alfalfa. A perennial legume that requires a well-drained soil with a pH of 6.0 - 7.0. Seeding 14 lb/A in early April will result in the best stands. Incorporation should occur before winter. If alfalfa is allowed to overwinter, incorporation can be difficult.

Marigolds. Marigold is a relatively new cover crop that has generated much interest among strawberry growers for its ability to suppress weed and nematode populations. Marigolds are used as a preplant cover crop in Northern Europe and to some extend in North America. As a warm season crop, marigolds germinate only when soil temperatures exceed 65F. Seed at the rate of 5 lb/A and shallowly incorporate the seed to a depth of 1/2 inch. Overhead irrigate to promote germination. Plants do not have to flower to provide benefits, and they can be plowed under after growing for 90 days or more.

Use open-pollinated seed rather than the expensive hybrid seed. Open-pollinated seed sells for about $30/lb. Little is known about the suitability of various varieties of marigold as a preplant cover crop.

Canola/Rape/Brassicas. Mustards are increasingly being used as a preplant cover crop because they contain certain chemicals (allyl isothiocyanates) which suppress weeds, nematodes and soil-borne pathogens, and they have an extensive root system. Grass suppression is notable with a brassica cover. Varieties and species (*Brassica nigra* and *B. juncea*) with a high glucosinolate content are preferable over those bred for oil production. Mustards are adapted to cool, wet conditions, and are easily established if planted in late August (5 lb/A) and weed pressure is not too severe. Once established, they can out-compete many weeds because of their exceptional cold-hardiness.

Native prairie plants. Native prairie plants are adapted to a wide range of soil conditions and include both grass and broad-leaved species. A pure stand of a species is slow to establish from seeding and a mixed-species stand is established more quickly. If a pure stand is desired, plug plants may be set into the field, but direct seeding is a cheaper method of establishment. Some prairie plants require stratification of seed for germination. After establishment, low maintenance is required.

Prairie plants are renowned for their extensive root systems and for improving soil structure. Recent research by Dr. John Potter of Agriculture and Agri-Food Canada in Ontario discovered that some native plants are poor hosts for root lesion nematodes (*Pratylenchus penetrans* Cobb). In particular, switch grass (*Panicum virgatum* L) and black-eyed susan (*Rudbeckia hirta* L) were easily established in Iowa (research by G. Nonnecke et. al), and were a poor host for root lesion nematode in Ontario (research by J. Potter et. al). Dr. Harry Jan Swartz (Univ. of Maryland) has worked with native warm-season grasses as cover crops. His research is investigating seed germination, seeding rates, and the use of native plants as living mulches.

Nursery sources for seed of native plants can be obtained through the local cooperative extension service, local native plant societies, or county conservation boards.

Table 1. Relevant characteristics of various cover crops.

Cover crop[1]	Water use	Establishment	Vigor	Durability
Hard fescue	Mod[2]	F	Lo	Ex
Tall fescue	MHi	G	Hi	Ex
Creeping red fescue	Mod	VG	Lo	VG
Chewings fescue	Mod	G	Lo	VG
Perennial ryegrass	Mod	G	Mod	G
Annual ryegrass	Mod	G	Mod	P
Rye (*Secale cereale*)	Hi	VG	Hi	P
Buckwheat	Hi	VG	Hi	P
Sudan grass & hybrids	Hi	VG	Vhi	P
Oats	Hi	VG	Hi	P
Marigold	Hi	F	Mod	P
Clovers/legumes	Hi	F	MHi	F
Prarie grasses	Mod	F-G	MHi	G
Prarie broad-leaved species	Mod	F-G	Mhi	G

[1] Mixtures of sod grass types may perform better than single species.

[2] Key to ratings: P=poor, F=fair, G=good, VG=very good, Mod=moderate, MHi=mod high, Ex=excellent, Hi=high, Lo=low.