

COVER CROPS FOR RASPBERRY PLANTINGS

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The raspberry grower can use cover crops in several ways that will improve the health and productivity of a planting. Cover crops can be used before the raspberries are planted, plants can be set into a killed cover crop, and cover crops can be seeded between the rows of established plantings. In all three cases, cover crops help to improve soil structure and organic matter content, and suppress weeds and possibly nematodes.

Preplant Cover Crops

Seeding a cover crop on a proposed planting site a year or two before planting is an excellent way to improve soil structure, especially on sandy soils where organic matter content may be low. Cover crops will prevent erosion on sloped sites prior to planting raspberries. Most cover crops grow under a wide range of soil conditions, and except for small additions of N, P and K (typically 40 lbs/A of each), other amendments are not likely to be required. 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 used. Small grains or seed from clover or buckwheat cover crops can be harvested and sold to recoup establishment costs.

Preplant cover crops are usually plowed under in the late fall or early spring prior to planting. Those with low nitrogen contents (grains and grasses) should be plowed under in fall to allow adequate time for decomposition. Legumes contain more nitrogen and decompose quickly, so can be turned down within a month of planting.

Preplant covers as killed sods

Some growers are experimenting with planting fruit crops into a mowed or killed sod of grain rye, rather than planting into bare soil. This method reduces the requirement for herbicides in the first year - at a time when many plants are sensitive to even low rates.

A sod residue suppresses weeds for several weeks while the raspberry row becomes established, and minimal soil disturbance results in reduced weed seed germination. To use a this system, seed grain rye in autumn, and mow it (at 18 inches) in spring when the rye plants start to flower (or spray it with paraquat). Wait a couple of days then plant into the rye residue. With this system, creating bare soil suitable for weed growth is minimized. Weeds are controlled for 6 to 8 weeks after planting without any herbicide, and for even longer with a preemergent herbicide.

Alleyways

Many raspberry growers find it advantageous to establish a permanent sod cover in the alleyways of raspberry plantings. A sod alley allows pickers to enter the field shortly after a rain and prevents injury to the root system of the raspberry plant that occurs when row middles are cultivated. Alleyways must be mowed, and occasionally fertilized, but otherwise require little maintenance.

Perennial grasses (i.e. ryegrass and fescues) are the best choices for row middles. They establish well, do not grow tall, and do not spread laterally at a fast rate. However, they are sufficiently competitive with other plants to reduce weed numbers in the planting.

Seed permanent cover crops in September, if possible, when temperatures are cooler and rainfall is more dependable. If grasses are seeded in late spring, overhead irrigation may be required to promote germination. Some growers seed the entire area with grass the autumn prior to planting raspberries, then spray out strips with glyphosate prior to planting. Others plant raspberries first, then seed the grass in September of the first growing season.

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, and 5) the length of time the crop will be allowed to grow.

Preplant only

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 seedings in late May or early June are superior to summer seedings 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. Seedings made during July and August tend to be much more successful than seedings 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 Seedlings 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: 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. Alfalfa is 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 extent 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 outcompete many weeds because of their exceptional cold-hardiness.

Permanent row middles

Fescues Several types of fescues are available for permanent row middles such as creeping red, Chewings, hard and tall. Each are seeded at a rate of 70 - 80 lbs/A in April-May or August-September, and costs about \$3.00/lb. Tall fescue is most tolerant of the four to low pH soils. Often these are sold as mixtures with other species because most fescues are slow to establish. These companion mixes consist of species that germinate and establish quickly, but are less competitive so will later be replaced by them. Creeping, Chewings and hard fescues require little mowing.

Perennial Ryegrass Seedlings of perennial ryegrass become established faster than seedlings of other common perennial grasses such as the fescues, timothy, brome grass and orchard grass. Perennial ryegrass can be used as a preplant cover crop because the fibrous root system and vigorous top growth provide substantial material for incorporating into the soil in early spring. Also, perennial ryegrass can be used as a permanent grass for between the rows, and some varieties require little mowing. The dry matter root growth is approximately equal to the top growth. With many crops, the top growth represents sixty to seventy percent of the material turned under at plowing. A 25 pound seeding rate results in a seed cost of approximately \$30.00 per acre.

Legumes. Clovers, alfalfa and vetches are not recommended for row middles in raspberries because they have a very high water use, their nitrogen contribution is minimal because the crop is not incorporated, and legumes are host for several disease and insect pests that can affect raspberries.

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 (<i>Secale cereale</i>)	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	Mod-Hi	F

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

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