



Cover Crops

Fall is prime time for planting a cool season cover crop in your vegetable garden. Cool season cover crops are plants grown to add organic matter and nutrients to the soil while protecting it from wind and water erosion. Many cover crops are not allowed to completely mature before they are tilled into the soil as “green manure” prior to planting (plants are incorporated into the soil to provide organic matter and nutrients). The cover crop residue can also be mowed and left as a mulch on the soil surface.

Cover crop plants can be a single species or a combination of species suited to your climate and gardening objectives. Legumes are commonly used as green manure cover crops because of their ability to convert atmospheric nitrogen into plant-available nitrogen in the soil. Atmospheric nitrogen is in the form of N₂ and makes up 78% of earth’s atmosphere. It must be converted to ammonium or nitrate to be usable by plants. Legumes are plants such as alfalfa, peas, beans, clover, vetch, and their relatives (also mesquite and cat claw trees) which when growing in the presence of rhizobium bacteria, can convert atmospheric nitrogen to plant available nitrogen. Gardeners promote this phenomenon when they grow leguminous cover crops. Rhizobium bacteria are used to inoculate legume plants where they perform this conversion in the developing plants. This is a symbiotic relationship where the legume receives nitrogen from the bacteria and the bacteria receive sugars from the plant.

Legume cover crops can add up to 300 lbs. of nitrogen per acre. Some cool season annual legumes suitable for cover crops include common vetch, hairy vetch, sweet clover, red clover, and medic. Alfalfa is sometimes used as a cover crop; its roots penetrate deeply into the soil.

Hairy vetch is an excellent cool season cover crop for the mid- and high-elevation areas of Yavapai County. It grows slowly in fall, but root development continues over winter. Growth quickens in spring, when hairy vetch becomes a sprawling vine up to 12 feet long. Field height rarely exceeds 3 feet unless the vetch is supported by another crop. The stand smothers spring weeds and can help you replace all or most N fertilizer needs for crops planted subsequently.

All legume seeds should be inoculated with the proper strain of Rhizobium bacteria to ensure optimum nitrogen fixation. Garden catalogs that offer cover crops usually have detailed instructions about which inoculants to use and how to use them. Make sure you buy fresh inoculant each year. Studies have shown this to improve nitrogen fixation by cover crops.

The inoculant is packaged in a mixture containing finely ground peat. To inoculate, place the seeds in a bowl with just enough water (milk can be used because it is stickier) to barely moisten the seeds then add the entire package of inoculant. Stir to coat seeds with inoculant and sow immediately. After broadcasting, gently rake that soil to shallowly cover the seeds with soil.

Quite often, cover crops also include annual grasses to increase soil organic matter. Grasses have fibrous root systems that utilize nitrogen released by the legumes and decompose readily to contribute organic matter. They also sequester excess nitrogen and prevent it from leaching below the root zone or into groundwater. When tilled into the soil, the foliage from these plants also contributes nutrients and organic matter.

A cover crop containing a mixture of grasses and legumes will have many complimentary effects. Annual grasses germinate quickly and act as a nurse crop for the legumes. As time goes on, the grasses provide a scaffold for other plants, such as legumes, to grow upward and spread. A diverse mixture of plants also encourages a diversity of insects: both pests and beneficials. The pest species will prefer the dense vegetation of the cover crop to adjacent crop plants. The beneficial insects will be present if and when the pests decide to attack your crop plants.

Northern Arizona is ideally suited to fall cover crop plantings. Some warm season cover crops (alfalfa and sudangrass) are also well suited but these may require frequent watering until the monsoon season arrives. Given the intensity of our monsoon rains, cover crops also make good sense for reducing soil losses on areas of bare ground.

There are some cover crops that are neither legumes nor grasses. These include buckwheat, mustard, oil seed radish, Phacelia, rape, and others. These are usually planted with a specific objective in mind. For instance, buckwheat attracts beneficial insects, mustard has a taproot that breaks up compacted soils.

Cover crops can also be grown to meet other objectives. Mustards, radish and rape are also planted to decrease root knot nematode populations. Root knot nematodes are plant parasitic, microscopic roundworms that can severely stunt plants. Borders can also be planted with plants that attract and feed beneficial insects such as predatory mites and wasps, lady beetles, lacewings, syrphids, tachnids, and predaceous beetles. Some of the species in these seed mixes include: clovers, gypsophila, buckwheat, alyssum, nasturtium, yarrow, carrot, dill, daikon, celery, radish, fennel, caraway, chervil, and coriander.

In the past, I've sown a mixture of 85% hairy vetch and 15% cereal rye in mid-October or early November. By early May, the rye was five feet tall and the vetch was trailing on the ground and climbing up the rye. I use a line trimmer to chop the plants into small pieces before incorporating the material into the soil. If you grow a legume, pull a plant up every now and then to observe the nodulation of the roots by the Rhizobium. Pink nodules on the roots indicate colonization by Rhizobium and effective nitrogen fixation.

When the cover crop has served its purpose, it can be tilled into the soil as green manure. Green manure adds organic matter, nitrogen and other nutrients that were contained in the leaves, stems and roots of the cover crops. The green manure should be allowed to decompose for at least three weeks before planting. Here again the combination of grasses and legumes will have the greatest benefit. Legumes add nitrogen and decompose easily while grass roots add easily decomposed organic matter. The grass leaves are less easily decomposed and will contribute organic matter over a longer period.

The practice of cover cropping and green manuring are not just for organic gardeners. These are sound agricultural practices that decrease soil losses, increase soil fertility and organic matter, and lower inputs of nitrogen from commercial fertilizers. Cover cropping is a sustainable, economical, and labor-saving way to maintain soil tilth and productivity.



Cereal rye and hairy vetch growing in spring (Photo: Jeff Schalau, University of Arizona).



Cereal rye/hairy vetch cover crop that has been chopped up and is in the process of being tilled into the soil as green manure (Photo: Jeff Schalau, University of Arizona).



Evidence of nitrogen fixation - nodules on roots of hairy vetch (Photo: Jeff Schalau, University of Arizona).

July 21, 2022

Adapted from original Backyard Gardener publications by Jeff Schalau, Agent, Agriculture & Natural Resources, University of Arizona Cooperative Extension, Yavapai County

The University of Arizona is an equal opportunity, affirmative action institution. The University does not discriminate on the basis of race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information in its programs and activities.