A3562

ORCHARD-FLOOR MANAGEMENT FOR FRUIT TREES

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The high cost of establishing an orchard necessitates cropping the trees early and harvesting the maximum amount of quality fruit that the tree will support. The orchard-floor management system can greatly affect earliness of bearing and yield. For example, weeds or grass growing in the orchard will compete with fruit trees for water, nutrients, and sunlight. One experiment demonstrated that grass growing near the trunk of apple trees delayed fruiting and reduced trunk diameter and shoot length when compared to trees surrounded by an area that had been kept weed-free with mulch, cultivation, or herbicides. Also, grasses were more competitive than broadleaf weeds or brambles. In another experiment, adding more nitrogen did not overcome the competition imposed by grass.

Decisions about how the orchard floor will be managed should be made **BEFORE** an orchard is planted. Management practices for orchard-floor maintenance should be executed in a timely manner during the lifetime of the orchard. This bulletin indicates some of the factors to consider before making decisions about the orchard floor and suggests ways to improve orchard-floor management.

ORCHARD-FLOOR MANAGEMENT SYSTEMS

An ideal orchard floor would be easy to maintain, aid the growth of the trees and fruit, maintain the soil structure of the orchard, reduce erosion potential, and not compete with the trees for water or nutrients, nor harbor insects or other pests. In practice, no single orchard-floor management system accomplishes all of these goals, but rather a balance of the above factors should be achieved while also considering the soil type, slope, age of trees, irrigation, and harvesting methods.

Several general systems for managing orchard floors are available, each with advantages and disadvantages to consider before choosing which to use:

- Grass alleys between tree rows with vegetation-free strips in the tree row;
- Solid vegetation cover;
- Total clear cultivation (either by cultivation or herbicides);
- Mulches in the tree row.

Grass Alleys with Vegetation-Free Strips

This is the most popular method of orchard-floor management. It has many of the advantages of both solid grass cover and clean cultivation. Usually, herbicide or cultivation is used to establish a weed-free zone of 2.5–3.0 feet on each side of a row of trees, giving a total strip width of 5–6 feet (Figure 1). A cover crop, usually a grass, is planted and maintained in the alley between the tree rows. The herbicide strip provides an area where roots can grow without competition from weeds or grass sod. In orchards with a weed-free zone, most of the root growth occurs in the weed-free area, especially for young trees. The grass alley provides a solid place for equipment travel, helps prevent soil erosion, and helps increase water infiltration. Sod also helps to maintain soil structure. Depending on the cover crop sown, weed invasion can be minimized and sod establishment can be fairly quick.

Solid Grass Cover

Solid grass cover has been used by many growers in the past. It is particularly effective on steep slopes where erosion is a severe problem. However, solid grass, or other solid vegetation cover, has some major drawbacks. Vegetation competes with fruit trees for nutrients and water, which reduces tree vigor and results in decreased yields, small fruit size, and shorter, less-vigorous shoot growth. Vegetation growing right up to tree trunks is also difficult to mow. Mowing equipment can damage trees if driven too close to them, while a tuft of vegetation around tree trunks creates a favorable habitat for rodents. Rodents feed on the bark of young trees and in severe cases will kill the tree. For more information see Extension publication *Meadow Mouse Control* (A2148).

Figure 1. Grass alley with vegetation-free zone in the tree row.

Clear Cultivation

This system generally is not used in Wisconsin, but it is common in more arid regions of the country. Herbicides or shallow cultivation are used to remove all vegetation from the orchard floor. This method is advantageous on sites experiencing frequent radiative spring frosts because bare soil radiates more heat back into the environment than does a cover crop. Cultivation may improve water infiltration in some soils, but frequent shallow cultivation may damage feeder roots near the surface, reducing tree vigor. In Wisconsin, soil erosion is also a major concern when all vegetation is removed. Clear cultivation does not provide satisfactory traffic support: during rainy periods it may be difficult or impossible to continue orchard operations. Maintaining a vegetation-free orchard floor is expensive using either cultivation or herbicides.

Mulch

Mulches conserve soil moisture and inhibit weed growth around trees. Effective mulches include straw, sawdust, hay, leaves, chipped prunings, and shredded newsprint. Mulches are expensive to purchase and apply each year. They do not control weeds effectively for long periods of time, especially perennial weeds. Organic mulches may bring additional weed seeds into the orchard. As they decompose, some organic mulch materials tie up available soil nitrogen.

Development of synthetic plastic film and spun-bonded polyester fabric mulch materials have added another management option. Insufficient experience with these materials precludes recommending their use at the present time, however.

Table 1. Characteristics of common cover-crop grasses used in apple orchards.

Grass	Height	Sod forming	Drought tolerance	Shade tolerance	Durability
Perennial rye	low	no	fair	poor	good
Red fescue	low	yes	good	good	poor
Kentucky bluegrass	low	yes	fair	poor	medium
Bromegrass	tall	yes	good	poor	good
Timothy	tall	no	fair	fair	good

COVER CROPS

Cover crops are important in maintaining soil structure, encouraging water infiltration, reducing erosion, reducing mud and dust, and maintaining a good driving surface. A good cover crop can be established with grasses, broadleaf plants such as legumes, or both, although a uniform plant stand is easier to manage than one made up of multiple plant species. A cover crop should establish itself quickly and thereafter should not require much maintenance. It should be chosen and managed so that competition with trees is minimal.

Legumes have been used as cover crops in some orchards, but they have several disadvantages. They typically use more water than grasses and are not as resilient under traffic. Perennial legumes such as alfalfa are difficult to eradicate from the orchard when they are no longer desired. Although legumes have the advantage of adding nitrogen to the soil, the grower has little control over nitrogen availability to the trees. If extra nitrogen were released in late fall, for example, winter hardening of the trees could be delayed.

Grasses are the most common cover crops in apple orchards. Many different grasses and grass mixtures are available, so the orchardist can choose one well suited to the specific orchard conditions. Table 1 lists common grasses used in orchards and gives information about their particular characteristics and suitability for use in orchards.

Ground-Cover Establishment

Preparation for ground-cover establishment should begin at the same time as preparations for orchard establishment. Perennial weeds such as Canada thistle and quackgrass should be controlled with nonresidual herbicides. Have the soil tested. If the test indicates liming is necessary, apply lime and incorporate it before the orchard and cover crop are established.

Grasses can be planted in either the spring or the late summer (August 15–September 20). Late-summer establishment is preferred because the soil is warm, which will provide for rapid germination, and because any annual weeds that may grow will likely be killed by frost before they flower and produce seed. Establish sod over the entire surface of the orchard in the fall before tree planting. Once the sod is growing well, mark out the orchard and kill the grass in the planting strip with paraquat or glyphosate. The dead sod will help prevent erosion during the winter. With sod already in place, planting will be easier and less muddy.

Ground-Cover Maintenance

Once a ground cover is established, required maintenance should be minimal. Maintenance operations include fertilizing, mowing, irrigating, and controlling broadleaf weeds. No nitrogen fertilizer above that required by the trees should be added for the cover crop. If possible, apply fertilizers only in the vegetation-free zone around the trees, where most of the tree roots are located.

Grass ground covers will require mowing several times each year. A mowing height of 3–4 inches is best. If dandelions or other weeds are in bloom at the same time as the fruit trees, the

weeds should be mowed to remove the flowers. Weed flowers compete with fruit-tree blossoms for bees; poor pollination may result. Mow again when seed heads have formed on the grasses but before the seed has matured. Once grasses have set seed, little additional upright growth will occur after mowing. Mowing just before harvest will facilitate moving ladders, bins, and boxes through the orchard. If much regrowth occurs after harvest, the orchard should be mowed again in the late fall to remove habitat favorable for rodents.

Drought tolerance is one measure of a good cover crop. Irrigation for maintenance of the cover crop should not be necessary. Perennial grasses will go dormant during the summer but will regrow in the fall with cool, rainy weather.

WEED CONTROL IN ORCHARDS

Weeds may be controlled either mechanically or chemically. Tractor-mounted implements are available for mechanical weed control in the tree rows. Mechanical control has the disadvantages of being nonselective, short lived, and potentially damaging to tree roots and trunks. In orchards where weeds are controlled by frequent or repeated tillage, tree roots are typically not found in the top 6–9 inches of soil. Mechanical weed control may also be impractical because of close orchard spacing and high fuel costs. However, it should not be totally excluded as a means of weed control.

The advent of chemical weed killers has given fruit growers many choices for controlling orchard weeds. A chemical weed-control program should utilize several compounds in rotation or in different allowable combinations. When one or two herbicides are used exclusively, weed populations not controlled by the herbicides become more dominant. This is called weed shifting. Achieve longer weed control by tank mixing a postemergent herbicide like paraquat or glyphosate with a pre-emergent herbicide like simazine (Princep) or oryzalin (Surflan).

Herbicides, like all pesticides, must always be applied in accordance with label directions. Herbicides should be applied with a low-pressure, boom-type sprayer fitted with flat fan-type nozzles. Low-pressure nozzles and pressures of 20–35 pounds reduce drift to non-target plants. **DON'T SPRAY IN THE WIND!** Calibrate the sprayer regularly in order to accurately apply herbicide dosages. Check the nozzles each year for wear and replace them if necessary. More information about chemical weed management for orchards is available in Extension publication *Commercial Tree Fruit Spray Guide* (A3314), which can be obtained from your county Extension office.

A single fall application of a 2,4-D amine herbicide can usually control broadleaf weeds such as dandelions. Dandelions are best controlled when they are actively growing. Dandelions should not be allowed to bloom simultaneously with fruit trees, because this alternative source of pollen and nectar decreases bee forage activity in the fruit trees.

While management of the orchard floor may not appear to be as important as other aspects of the orchard, it can have a major effect on fruit yield and quality. Orcharding in the future will demand that all orchard operations be integrated into one unified system. Orchard-floor management will be a part of these systems.

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