Groundcover Management in Vermont Apple Orchards

In apple orchard systems, it is rare that the trees stand in a strict monoculture with no other vegetation in the planting. Management of groundcovers both within the tree rows and in the drive alleys is important for many facets of the orchard including competition for water and nutrients, pest and predator habitat, ease of equipment and worker access, and modification of the orchard microclimate environment.

Weed-Free Strips

Apple trees, especially when young or on dwarfing rootstocks, do not compete well with other vegetation for water and nutrients. For this reason growers often maintain a bare strip within the tree row, for at least part of the season. Research in both arid western and humid eastern states has found a weed-free strip of 1.5-2 meters to be effective in maximizing tree growth and fruit yields over the life of the planting. Maintenance of this strip can utilize several methods including application of mulches, mechanical cultivation, and chemical weed control.

Mulch Application

Organic mulches including straw, wood chips, and mowed living covers vary in their effectiveness. Straw and green mulches are less effective than wood chips in limiting weed competition, and can create habitat for voles and other rodents that may injure trees. Wood chip mulches are effective but can be costly to procure and apply. Many tree service companies can provide whole tree chippings for a minimal cost compared to custom ground chippings. Wood chips should be aged ideally for at least one year before application to allow for an initial breakdown and stabilization of the C:N ratio to avoid tying of soil nitrogen. Application of organic mulches can be aided by mechanical spreading equipment. Best effectiveness of these materials occurs when applied to an already weed-free strip either by mechanical cultivation or herbicide application. Weeds may still grow in the mulch strip, especially creeping grasses such as some fescues and quackgrass, and may require additional spot herbicide treatment or hand weeding.

Mechanical Cultivation

Mechanical cultivation of the tree row can be very effective in maintaining the weed-free strip. There are many types of mechanical cultivators on the market that can efficiently control vegetation, but they can have serious drawbacks. Tillage should be as shallow as possible to avoid damage to the root system of the trees, and should be performed before weed become too large and woody. Mechanical cultivators can cause tree damage and destruction, especially if an operator proceeds too fast or does not have adequate training on the unit. Still, mechanical cultivation is a very effective tool particularly for organic orchards where chemical weed control options are limited in availability and effectiveness. Mechanical cultivation is also a good tool for preparing a soil surface for successive planting of an under-tree cover crop if desired.

Chemical Weed Control

Chemical weed control is the standard management technique used in maintaining a weed-free strip in IPM orchards. Herbicides fall into two classes, pre- and post-emergent, based on their type of activity. Post-emergent herbicides 'burn down' weeds that have begun to grow, while pre-emergent materials prevent weed seeds from germinating. Growers may use a combination of these materials to maintain the weed-free strip during the growing season. Use of any herbicides must be done very carefully in the orchard to ensure effectiveness without causing undue damage to the trees. The latest New England Tree Fruit Management guide, available from the Cooperative Extension Service of each New England state, contains crop specific recommendations for herbicide use in fruit plantings. A popular management strategy used in IPM orchards is to apply post-emergent herbicides in spring, usually just before bloom, with or without a pre-emergent material in the tank for residual weed control. A second or third application can occur 4-6 weeks later to maintain the vegetation-free strip.

Weed Control Window

Research has shown that the critical window for weed control is from early spring through midsummer, and in fact some crops may benefit from modest vegetative growth in the fall to tie up excess nitrogen and water, allowing fruit to develop better color and trees to harden off adequately before winter. It is important however that tree row vegetation does not become too thick to cause problems during harvest, nor to establish excessive seeds that will be more difficult to control the following year.

Other Groundcover Management Systems

Some planting systems which utilize vigorous semidwarf or standard rootstocks may forego the use of a weed-free strip. Plantings which use this system should have adequate tree vigor to compete with the sod groundcover, and maintenance of a weed-free area beneath the trees is still beneficial during orchard establishment. In-row covers are usually mowed at the same time as the drive alley utilizing an offset mower often with a 'swing arm' blade that allows close mowing to the tree trunks, kicking back the mower blade upon contact with the trunk. Mowing with this system must be done slowly and carefully to avoid tree damage from impact of the mower wheel with the trunks.

Drive Alleys

The other portion of the orchard system which requires management is the drive alley. Row middle groundcover may consist of the native grasses and broadleaf plants in the field, or can be deliberately established by the grower before or after planting. Planted mixtures can be chosen for desirable characteristics including slow growth rate, ease of establishment, resilience to tractor traffic, and limited creeping into the tree row. Popular groundcover blends used in Vermont orchards include conservation-type mixes which often include perennial ryegrasses, Kentucky bluegrass, and hard fescues. Some growers add a leguminous plant such as white clover to the mix, which will fix nitrogen naturally and help maintain the cover with minimal fertilizer inputs. Flowering broadleaf plants in the groundcover can attract bees, creating competition for the trees during bloom, as well as subject them to insecticide applications when they are not wanted in the orchard. Some plants can also attract tarnished plant bugs which may become pests in the orchard. Some feel that maintaining these flowering plants until after bloom is beneficial in that it keeps these pests out of the trees, so mowing may be delayed until after bloom.

Row middles should be mowed several times during the growing season. Tall cover allows rodent populations to build, hampers orchard management activities, and can increase the humidity of the micro-environment, increasing fungal problems in the lower portions of the trees. Mowing equipment generally falls into two types- rotary mowers and flail mowers. Rotary mowers can cover a lot of ground fairly quickly, and the side discharge of clippings provides some natural much to the planting, but their repair and maintenance costs can be higher than flail mowers. Flail mowers use vertically rotating knives that chop residues very finely, and are often used to chip prunings in the orchard in spring. Flail mowers also shred leaf litter, allowing for better decomposition which reduces inoculum of apple scab, leafminers, and other foliar pests. Either mower type should be offset to allow it to operate under the tree canopy.

Useful Links:

- Orchard Floor Management in Apples
- Long-term orchard groundcover management systems affect soil microbial communities and apple replant disease severity
- Orchard floor management practices alter soil microbial community composition

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