

WEED MANAGEMENT IN ORCHARDS AND VINEYARDS, “WHAT THE FUTURE WILL BRING”

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Predicting what the future will bring is of course very difficult, even when you know the past developments. One can let their imagination run wild and see if the future catches up or one can be realistic and plan for some short-term goal. I will try to do a little of both today.

In the past we often had weedy or “dirty” orchards and vineyards, that is, the growers would allow plants to grow in between the tree or vine rows and even grow in the row until they could cultivate in the spring and early summer, thus weeds were growing all winter in the orchards. Cultivation with disks or mowing were about the only method of control. Often trees were planted far enough apart to get equipment between the row and between the trees, thus they could cross disk. Sometimes the weeds were grazed by livestock between the trees. The weeds were not native plants, but introduced species that had naturalized in California. I am mentioning this because more growers are allowing weeds to grow in the winter months again.

There was early research with cover crops in orchards. In 1922, peach trees were planted and cover crops were planted in 1923 at Davis. The purpose of the studies was to increase water holding capacity of the soil. Though it was not measured, the water holding capacity could be related to the organic matter of the soil. They stated that “under the warm, semi-arid conditions of Davis, in an irrigated orchard, cover crops have not increased either nitrogen or moisture-holding capacity of the soil during a 10-year period. The same authors reexamined the study after 25 years. They found that annual cover crops did not increase the organic matter, total nitrogen or water holding capacity at Davis. Alfalfa did increase total nitrogen but not water holding capacity. In other climates with less oxidation of organic materials, this result may not be valid. There is also research to show that planted cover crops act similarly to weeds to reduce nutrients and water that should be available for the crops.

Much of the weed control methods that we see today started with full floor treatment of citrus groves with herbicides in the late 50’s and early 60’s. These herbicides were not safe to use on deciduous fruits and vines and were not an adopted practice until simazine and diuron were introduced. Work by B. Day, A. Lange and others showed that a strip treatment of herbicides in the row reduced costs, reduced herbicides and continued the advantages of keeping the weeds away from the base of the trees and vines. Additional new herbicides were introduced to fit this niche market. Those herbicides are used today and include such herbicides as napropamide, oryzalin, pendimethalin and oxyfluorfen.

Where are we going from here?

New Equipment

There has been a renewed interest in small equipment for more precision cultivation. The French or hoe plow has been modified to have in-row cultivators with a similar trip lever design for many cultivators such as the Kimco, Clements, Howard, Weed Badger and others. These have become more precision and efficient for controlling weeds. They tend to be easy on young

plantings and leave less of an “island” of plant materials round the base of the plant. Some are effective only on young weeds but others are good at even controlling large weeds. If weeds aren't removed when they are young, the competition for nutrients and moisture is still occurring. These cultivators still also cut surface roots where much of the nutrient uptake is occurring. They tend to be slow to use because of the precision and are thus somewhat expensive to use. The cultivators are needed more than once during the season as new weeds germinate and grow.

There are also in-row mowers and mowers that can be used between the rows to reduce weed growth. These mowers can be adapted to throw the mowed biomass into the tree or vine row as a mulch to reduce annual weeds. There will be mowers that are more adept to cut and throw the biomass than those found today. They will probably be adjustable in width and will deliver both directions into rows. They may also be found where they can cut in front of the tractor, rather than currently from behind.

Mulches

There will be an increase in the use of mulches in trees and vines, at least until there start to be rodent problems with the mulches. The mulches are going to be both organic (wood and plant by-products) and synthetic organic products such as polypropylene and polyester geotextiles. There are large amounts of yardwaste that is being generated in the cities. Because of the large quantities, it is feasible that the price of mulch will be cheap enough that the transportation costs will not price it out of the market for agricultural uses. The consistency of the product must be improved before it can become a major source for use. Other by-products from agriculture that may be used include grape pumice, rice straw and almond shells. Control of annual weeds can be good with these products if they are distributed uniformly and reduce light enough to inhibit seedlings. Perennial weeds will become more prominent unless herbicides continue to be used. Mulching with geotextiles is high cost up front but if it is cared for in the field so it will not be ripped or displaced out of the row, it will last for years. There will be major claims for better growth and crop quality to persuade growers to use these materials.

Plants may be selected that have been shown to have additional benefits beyond light suppression. If it can be shown that allelopathy is present in a species it may be possible to transfer this trait to other plants that can be used as a suppressing species, either while growing or as a dead mulch in the tree or vine row. Of course it will be required that the tree species will tolerate the chemicals and not cause a residue in the fruit.

Herbicide application

Another technology that is in its infancy is the use of light sensitive sprayers. The one machine that is on the market today works well in low population (low % ground cover) to help save the amount of herbicide needed to control weeds. The techniques of using a mulch in the row and then this light reading applicator to control escaped weeds can greatly reduce herbicide use. Can this be used to selectively control broadleaves in grass cover crops, or could it be used to selectively control narrowleaf plantain (supports rosy apple aphid) in a cover crop without killing all the cover to reduce weed and insect problems? How specific can this technology become?

Non-herbicide equipment

A technology that has not been developed but may have potential, is the use of a moderate energy laser that could be directed to the base of trees and be roughly parallel to the ground or directed toward the base with multiple heads to burn off weeds at the ground level. The bark of the tree is dead and should protect the tree or vine; thus weeds could be controlled without a lot of energy. It would control weeds without a concern for residue in the fruit or soil and thus have little environmental concern.

Herbicides

New herbicides and new registrations of current materials should occur. Herbicides that need additional registrations include pendimethalin for bearing trees and vines, clethodim for bearing trees and vines, and thiazopyr for deciduous trees and vines (currently registered on citrus). There are four new herbicides that currently do not have any registrations in trees and vines that may get registration for some trees crops, 1) sulfosate (Touchdown) is a glyphosate trimethylsulfonium salt. It is a postemergence herbicide with many of the same characteristics of the glyphosate that you know now. It should have many of the same uses in trees and vines. 2) clopyralid (Stinger) is a postemergence herbicide that is exceptionally effective for the control of Aster family weeds. It has some soil activity and this may limit its use in some areas and some crops. 3) glufosinate (Rely, Ignite) is a postemergence herbicide that controls a broad spectrum of annual and perennial weeds. Though it is primarily a contact material, it does translocate some in plants, thus achieving a broader spectrum and better control. 4) azafenidin (Milestone) is primarily a preemergence herbicide with some post activity with some weeds. It has activity on both annuals and some perennials. It has soil activity and should combine with or replace some current herbicides. There will not be many new herbicides developed for trees and vines in the long term, but those developed will have to be specific and safe to use. This safety will include not only safety to the tree or vine but to the workers, applicators and the environment.

Other factors influencing vegetation management in orchards and vineyards.

Another factor that may impinge upon weed control in trees and vines include regulations on dust generated in the management process such as disking, floating and harvesting. The management of the orchard floor may change to accommodate these problems. This may promote more plant materials (cover crops) planted in orchards and vineyards where the commodity is not harvested from the ground.

If there is an increase in the number of orchards and vineyards that use resident vegetation or planted cover crops, there will be an increase in water use. This water use may be monitored to reduce unmaintained plantings if there is a reduction of water for agricultural use. Likewise the movement of insects, pathogens or weed seed from these low maintenance orchards or vineyards may create problems between neighbors.

The future

As there are more orchards and vineyards allowing weeds (covers) to grow in the field, have we finished the full circle of vegetation management in orchards and vineyards? Have we gone from vegetation, cultivation, mowing, herbicides and back to vegetation? Maybe this will occur in some areas, or some orchards, but not in the majority of the orchards and vineyards of California. I foresee a continued use of herbicides in strips in the tree or vine rows with cover crops or resident vegetation used between the rows.