

College of Agriculture and Life Sciences

Protect and Enhance the Nation's Resource Base and Environment

Weed Control With Less Herbicide in Arizona Tree Crops

Impact Nugget

A weed-detecting automatic spot sprayer system reduced the amount of herbicide by 67 percent in an orchard irrigated with microsprinklers (i.e., only part of the orchard floor is irrigated), and about 50 percent in flood-irrigated lemon and pecan orchards. If the automatic spot spray system were adopted on 50 percent of the lemon and pecan acreage in Arizona, with a 50 percent reduction in the amount of herbicide applied (currently about 2 gallons of glyphosate per acre annually at a cost of \$14 per gallon), the annual savings would be about \$14 per acre at the cost of current weed control programs, resulting in a statewide savings of about \$252,000 per year.

Issue

Weeds covering an orchard floor compete with the trees for water and nutrients, reducing fruit or nut yield at harvest. Growers at different times have tried mowing, disking and cover crops for weed control. Mowing causes a weed shift to grass and nutsedge species that can be difficult to control and disking can prune roots and damage tree branches and trunks. Although leguminous cover crops suppress weeds they also compete with trees for water and may reduce yields. Weed populations occur in patches across fields and are usually controlled with chemical herbicides. Most growers currently broadcast spray post-emergence herbicides on the entire orchard floor, regardless of where weed patches are located. A few growers spot-spray weed patches where they exist and thereby reduce the amount of chemical used to control weeds.

Broadcast spraying the orchard floor wastes chemical and increases the herbicide load in the environment. Spot spraying reduces the amount of herbicide wasted but is labor-intensive, slow and costs more than broadcast spraying herbicides despite reducing the amount of herbicide sprayed. University of Arizona researchers are investigating how growers can reduce herbicide use and save money by automatically spot spraying herbicides only where weeds exist in Arizona tree crops.

What has been done?

A comprehensive series of weed management studies in lemons have been conducted by faculty in the University of Arizona College of Agriculture and Life Sciences at multiple sites since 1993. These studies have proven that clean culture, where the orchard floor is kept completely free of weeds using herbicides, still provides the best environment for lemon growth and maximizes yield, both for the first harvest and for the cumulative yield of all harvests in a season. Similar studies in pecans were conducted in two locations in southern Arizona where the orchard floor along the tree row is free of vegetation but a grass strip is grown in the middle between the rows.

An optical chlorophyll-detecting spray system currently on the market detects weeds on the orchard floor and automatically triggers spot applications of herbicide directly to them without spraying bare ground. Called the NTech WeedSeeker, this boom-mounted system is used in some commercial orchards in California, where it was developed, but it has not caught on in Arizona. The barriers to the adoption of this technology include its high cost and its untested performance under Arizona conditions. UA researchers have conducted tests of the automatic spot sprayer technology in commercial lemon orchards in Yuma and Hyder, Arizona and in pecan orchards in Sahuarita and Bowie, Arizona.

Impact

Study results show that conventional broadcast sprayers and the weed-detecting automatic spot sprayer system result in comparable weed control in lemon and pecan orchards with both types of systems providing good or commercially acceptable weed control. The type of irrigation used in an orchard makes a difference in the distribution of weeds and the amount of herbicide used. The weed-detecting automatic spot sprayer system reduced the amount of herbicide by 67 percent in an orchard irrigated with microsprinklers (i.e., only part of the orchard floor is irrigated), and about 50 percent in flood-irrigated lemon and pecan orchards.

Potential impact: The combined acreage for both crops in Arizona is about 36,000 acres. If the automatic spot spray system were adopted on 50 percent of the lemon and pecan acreage in Arizona, with a 50 percent reduction in the amount of herbicide applied (currently about 2 gallons of glyphosate per acre annually at a cost of \$14 per gallon), the annual savings would be about \$14 per acre at the cost of current weed control programs, resulting in a statewide savings of about \$252,000 per year. Costs savings increase as the cost of the herbicide program used for weed management increases.

In addition, there would be additional savings due to reductions in the amount of time workers spend mixing and loading herbicide sprayers, and health benefits for workers who have less exposure to herbicides. Environmental benefits would accrue as well, with 50 percent less herbicide released into the environment compared to conventional spray methods.

Funding

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