

## Computerized vegetable weeding looks promising

By Bob Johnson

Farmers and researchers look constantly for effective new ways to fight weeds and today, computer technology is taking automated weeder-thinners to a promising new level.

There is already competition among firms offering commercial versions of applicators that target errant plants using software that interprets photos taken by tractor-mounted cameras, and researchers are to the point of looking for, and finding, which materials will be most effective for these precise applicators.

“The advantage of using a spray is there are fewer moving parts; it is simpler than a cultivator. It’s to the point that there are three companies that are providing spray thinners that use computers. These computer-controlled weeder-thinners have become commercially viable. One of the things we need is a good spray material that will work well under all conditions,” said Richard Smith, University of California Cooperative Extension farm advisor in Monterey County.

As labor for hand weeding and thinning becomes ever more difficult to find, advances in computer power are making possible new technologies that automate these tasks.

Smith spoke about the encouraging results from a year of looking for materials that can kill unwanted weeds or lettuce with a single, well-aimed squirt with the pest control advisors and growers at the annual Salinas Valley Weed School in Salinas.

“In addition to herbicides, there are fertilizers and acid materials. We really focused our efforts on fertilizers,” Smith said.

One of the most effective products looks to be an

organic herbicide that is still going through the registration process, Bio Link, which is a fatty acid-based herbicide from Westbridge Agricultural Products of Vista.

“Interestingly, a 12 percent application of the organic material Bio Link looked amazingly good,” Smith said.

A 14-0-0-5 fertilizer was another material that gave respectable results under the right weather conditions.

“Using fertilizer as an herbicide is an issue you will have to take up with your ag commissioner. It will vary county by county,” Smith cautioned.

Another issue to consider is that the fertilizer appeared to lose effectiveness in the morning dew.

“We did a trial under tough conditions; we did the applications right at dawn, when it was in the low 60s with a lot of dew on the plants. Lettuce is a little difficult to kill, and some of the materials were not giving as good of results in the morning when there was dew on the plant,” Smith said.

There is relatively little danger that waiting for the plants to dry will bring drift problems because the application is shielded, he said.

The trials also showed the importance of thinning lettuce as soon as possible after planting, to get maximum effectiveness from the precise application of very small amounts of the material.

“Everything looked better at 14 days after planting than 21 days. Everything looked better if you treated earlier,” Smith said.

It may be necessary to adapt these automated thinners to also weed, because there are precious few new vegetable herbicides on the horizon, said Steve Fen-

nimore, UCCE vegetable weed specialist.

“I have not had a lot of chemical companies knocking on my door saying they have an herbicide they want me to test on lettuce. I hear the opposite; they say, ‘I can screen materials on lettuce, but there is no way we’re going to register them on lettuce.’ The few new herbicides that come to market will not fill many of the existing gaps in vegetable weed control,” said Fennimore.

One promising new weeding technology is satellite-based maps of where crops are planted that are so precise they can be used to guide the tractor as it comes back later to cultivate very close to the crop without causing damage.

“With tomatoes, you can use GPS to map within an inch-and-a-half, which is close enough for cultivation,” Fennimore said.

Lettuce is planted too close together to use this GPS-based system, but camera-based, precision application of propane flame could make it possible to automate weed control even in these tightly spaced crops, he said.

“(Dutch researcher) Frank Poulson is working on precision propane. He’s flaming in little, half-inch squares,” Fennimore said.

Yet another weed control technology from Europe, where hand-weeding labor is even more expensive than California, is precise application of steam to remove weeds and pathogens just along the seed line before planting.

“We can band steam in lettuce for under \$100 an acre and get both weed and lettuce drop control. You can end up with a clean zone in the planting band. This is already being done with vegetables in the Netherlands and Sweden. The problem with dry heat is it is somewhat erratic. You get inconsistent results. With steam, you get almost fumigant consistency. Not quite, but almost,” he said.

Fennimore said he hopes that the new technologies can be used to reduce the amount of hand weeding, which will probably never be eliminated.

“We’re looking for ways to combine cultivation and application to reduce hand weeding. We do not discard technology. We’re still using the hoe, but it’s getting more expensive. We’re not trying to eliminate the hoe; we’re trying to reduce its use. Labor costs are going to keep going up unless we get a lot more people here who want to hand weed, which isn’t likely,” he said.

The high-tech weeder-thinner tractors are the culmination of more than a century of efforts to mechanize one of the hardest tasks in agriculture, Smith said.

“This kind of thing got started in Salinas when we had a strong sugar beet industry, and mechanical thinning research started at UC Davis in the 19th century,” he said.

The early camera-controlled systems of a few years ago used different sorts of blades to cultivate within the row, and this technology is still being researched.

“There are machines with various types of knives and blades. The mechanical thinners are still out there, but the enthusiasm hasn’t been there. The Tillet machine uses a rotary blade. It can be effective, but there are problems,” Smith said.

One problem is that it is very difficult to cultivate within the rows without damaging the crop.

High-speed computers have taken weeder-thinners to the next level with their ability to use photographs in real time to direct applicators, which can thin or weed without disturbing the soil.

“In the last 10 years or so, there was a big leap forward with computer processing of the photographs,” Smith said. “This was made possible by the speed of the computers.”

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