

Turning to the Sun— Instead of Methyl Bromide

RANDALL SMITH (K8607-4)



Plant pathologist Daniel Chellemi (left) and organic grower Kevin O'Dare inspect the progress of a soil solarization treatment.

ARS plant pathologist Daniel O. Chellemi has pulled out all the stops, looking for ways to sustain Southeast vegetable farmers after the loss of methyl bromide, now slated for the year 2005. Since 1992, his mainstay has been soil “solarization”—the process of heating soil under clear plastic for at least 6 weeks during the summer to kill off weed seeds and diseases that would otherwise destroy a winter crop.

Chellemi's efforts are paying off. In 1998, yields from solarized fields ranged from 96 to 123 percent of those from methyl bromide-treated fields on three of the four commercial farms cooperating in Chellemi's study. The fourth farm—an organic farm—doesn't use methyl bromide or any other chemicals.

The yields have improved over those in earlier years, when Chellemi collaborated with his former colleagues at the University of Florida at Quincy.

“We're getting better at it,” says Chellemi, who is now with ARS' U.S. Horticultural Research Laboratory in Fort Pierce, Florida. “The more familiar you become with the biology of the fields, the better the outcome.”

That's because solarization requires an integrated pest management (IPM) approach that can include chemicals and changes in cultural practices, depending on which weeds, diseases, or insects lie waiting in a given field. Chellemi has been looking at all possible combinations on farms ranging from 10 to 3,000 acres.

The field yielding the 123 percent had

been deep-disked before solarization to break up plant material that had not yet decomposed and to bring tiny, destructive worms called nematodes to the surface, where the sun and heat could destroy them. It was planted with peppers.

Another pepper field on the same farm, which had been shallow-disked, yielded 106 percent as much as a comparable field treated with methyl bromide. Where no disking was done before solarization, yields were virtually the same as those achieved with methyl bromide, at 99 percent.

On another farm, two solarized pepper fields yielded better than those treated with methyl bromide—118 and 104 percent. Soils in both had been beefed up with a biosolids compost before planting.

“For many growers who are willing to explore it, soil solarization can provide a viable methyl bromide alternative.”—**Daniel O. Chellemi**

It was the second year of solarization for the field yielding 104 percent and third for the one yielding 118 percent, Chellemi says.

“Although we’re not getting the residual benefits from methyl bromide fumigation anymore, yields are actually going up under soil solarization.”

Chellemi suspects that the revival of beneficial microorganisms—giving the soil a better balance—is behind the increased yields.

Nothing’s Ever Quite Perfect

Solarization has its drawbacks: It works only for fall planting, or for half the crop in the deep South. It doesn’t control all pests adequately, particularly root knot nematodes and the weeds portulaca and Bermudagrass—all of which succumb to methyl bromide. And it requires that the grower get started preparing beds at least 6 weeks before planting. That poses logistic problems for the larger operations, says Chellemi.

“Growers are reluctant to adopt IPM to control soilborne pests; they haven’t needed it for 30 years. IPM is a niche that will be filled by other types of professionals,” Chellemi says, noting that California now has groups of pest specialists who know the least toxic controls to use for specific pests.

But for organic grower Kevin O’Dare of Vero Beach, Florida, solarization saved his business. “I can’t say enough for it,” O’Dare says.

Purple nutsedge was close to taking over the 10 acres of Osceola Organic Farm, he says, and is even hard to control on conventional farms with chemicals. Last year, his second year of solarization, “our production was up 30 percent, our labor was down 75 percent, and our profits were up 100 percent,” says O’Dare.

He grows 10 varieties of lettuce, plus tomatoes, peppers, squash, eggplant, and culinary herbs. At Chellemi’s suggestion, O’Dare incorporated compost and manure into the beds and wet them down before solarizing. “When that mix heats up under clear plastic, it produces gases, some of which are toxic to soil pests such as fungi and nematodes and to weed seeds,” says O’Dare.

And diseases, which blemish produce, are kept at bay. One of O’Dare’s

grow 100 acres of tomatoes, rotating them over 400 acres.

During the last study, says Dale, “we had a respectable yield—encouraging enough to try again. We think we’ve learned from the mistakes we made.” The two most obvious ones were not burying the irrigation drip tape deep enough and not covering the clear plastic well enough with white paint before planting.

As a result, the sun burned holes in the drip tape, and the soil stayed too hot for the new plants to survive. “A good paint job is essential,” he says.

This year’s test field was home to root knot nematodes, so the Murrays injected a nematocide along with solarizing.

“We’d rather do a little study along the way than lose methyl bromide and have to do all the trial and error in a year,” says Dale. “It’s a big plus to have Dan Chellemi on the farmers’ side. He really works to find an alternative to methyl bromide.”

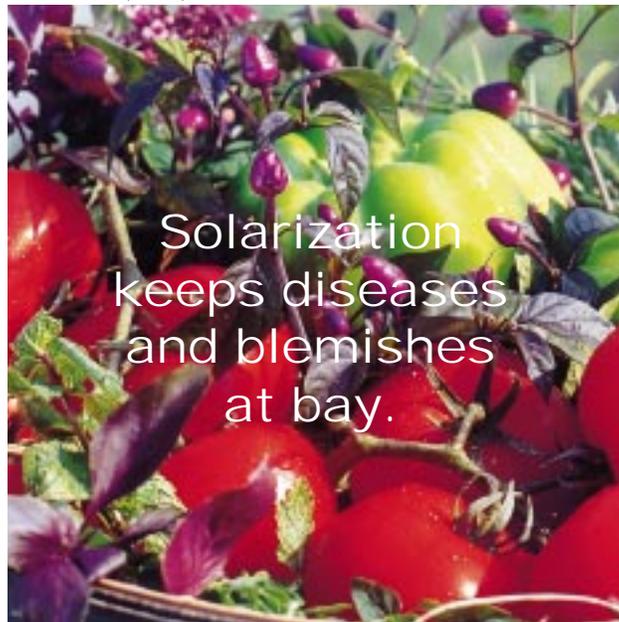
Now in his eighth year of testing soil solarization, Chellemi says, “There’s no doubt in my mind that it has a place. It’s not a universal replacement for methyl bromide, but it is a viable option for farmers who are willing to explore it.

“We want to tell growers that they’re not going to have a widespread crop failure if they use soil solarization.”—By **Judy McBride, ARS.**

This research is part of Methyl Bromide Alternatives, an ARS National Program (#308) described on the World Wide Web at <http://www.nps.ars.usda.gov/programs/cppvs.htm>.

Daniel O. Chellemi is at the USDA-ARS U.S. Horticultural Research Laboratory, 2001 South Rock Rd., Fort Pierce, FL 34945; phone (561) 462-5800, fax (561) 468-5668. ♦

RANDALL SMITH (K8605-3)



buyers commented that he “had never seen organic peppers as nice,” says O’Dare. What’s more, the covered beds require less water and fertilizer. “It’s a very sustainable system.”

A Little Bit of Trial and Error

Dale and Greg Murray of Decatur County, Georgia, are solarizing again this summer, after a 2-year hiatus. This year, the Murrays have increased their solarized acreage from 3 to 14 under the guidance of Steve Olson, professor of horticulture at University of Florida-Quincy, who is a former colleague of Chellemi. Each season, the brothers