

Soil Solarization Heats Up in the Low Desert

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Solarization—broad spectrum disinfection via passive solar heating of moist soil—has been around for several years now. Although originally targeted by researchers to serve as an alternative to chemical fumigation, it has mostly been adopted in the U.S. as a technique for home gardeners and small scale organic operations. Recently however, vegetable growers in the Imperial and Yuma Valleys have been catching on to solarization as a viable alternative to soil fumigation and herbicide use. And why not? Summer air temperatures in the low desert routinely hit 115°F plus during the summer—way too hot for most vegetable production, but perfect for knocking out soilborne pests between crops (Figure 1).

In the low desert, solarization is used mostly for control of weeds in both organic and conventionally-produced spring mix crops—leafy vegetables grown on wide beds and harvested by repeated mowing (Figure 2). Under this culture, there is a “zero tolerance” for weeds growing on the bedtops, and escapes must be rogued by expensive hand weeding crews.

Since solarization works by “top-down” heating, the maximal effect is near the soil surface, where many of the weed propagules of concern are located. In warmer areas, such as the Imperial and Central Valleys of California, and the Yuma Valley in Arizona, solarization can heat soil to more than 130°F at 3 inches depth, and more than 120°F at 6 inches (Figure 3). Heating, and thus control, diminishes with greater depth. Numerous studies have confirmed that excellent weed control can be achieved using solarization. Most growers form beds (and lay drip tape, if drip irrigation is to be used) before they solarize, rather than laying plastic on the flat field and bedding up later. By solarizing after forming the beds, a grower may plant immediately after treatment, and there is no need for subsequent cultivation which may bring up viable weed propagules from deeper in the soil. It should be emphasized that solarization is appropriate for use in warmer climatic areas—application in cooler and coastal areas may not predictably provide the same, desirable results.



Figure 1. Solarization film being applied to a field in July in the Imperial Valley.



Figure 2. A spring mix crop of arugula just getting started on wide beds for harvest by repeated mowing in the Imperial Valley.



Figure 3. An established spring mix field on wide beds.

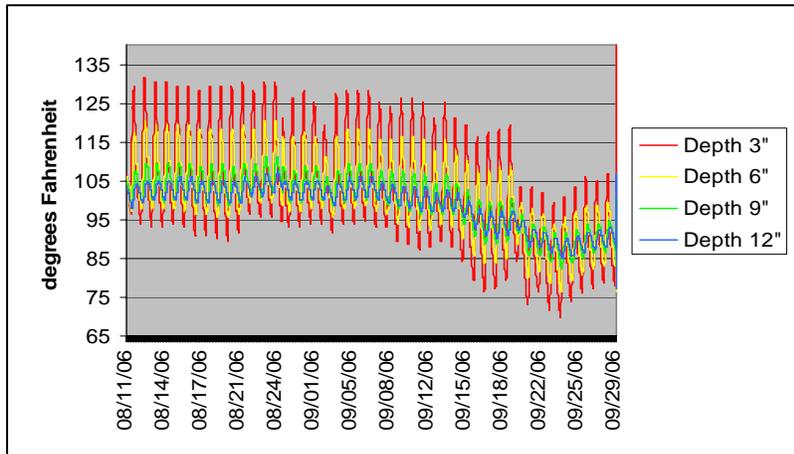


Figure 4. Soil temperature data from a recent, late-season (August-September) experimental plot at the UC Desert Research & Extension Center near Holtville.

Solarization is not just a weed control treatment—soil-borne pathogens and nematodes are also susceptible to the high temperature effects. In fact, in parts of the world where solarization is used primarily in conjunction with greenhouse production, soilborne fungal diseases are the main targets of the treatment, and there is a long list of pathogens successfully controlled. However, fungi, bacteria, and nematodes can cause problems to crops from origins deeper in soil than most weed seeds can successfully emerge—and sometimes deeper than solarization can effectively

reach. Also, there are certain pest species that are resistant to the effects of solarization—such as purple nutsedge (*Cyperus rotundus*) and the melon vine decline fungus (*Monosporascus cannonballus*). In such cases, solarization may be combined with pesticides, biological control agents, or organic amendments to provide additional control. For example, experiments are underway to test the combined effects of solarization and dazomet to control vine decline in Imperial Valley melons. This disease is resistant to both solarization and chemical intervention by themselves, but there are

indications that the combined treatments may provide economic disease control.

At this point in time, solarization should be considered as much a knowledge-based treatment as one based on product efficacy. So then, what resources are available for PCAs to acquire solarization know-how? Along with a call to the local UC Farm Advisor, one might start by taking a look at the UC Kearney Solarization Informational Website (<http://solar.uckac.edu>), Which provides links to references, temperature maps, weed seed inactivation graphs, contact information for solarization plastic suppliers, and more.

Resources for solarization users:

Soil Solarization Information Website (2007). University of California. <http://solar.uckac.edu/>

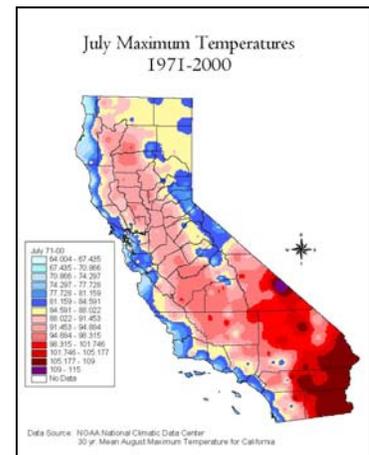


Figure 5. Month-by-month maximum air temperature maps are available on the UCKAC Soil Solarization Informational Website (<http://solar.uckac.edu>)

Elmore, C.L., J.J. Stapleton, C.E. Bell, and J.E. DeVay. (1997). *Soil solarization: A nonpesticidal method for controlling diseases, nematodes, and weeds*. DANR Publication 21377, University of California, Oakland. 14 pages. Available online: <http://solar.uckac.edu/>

Stapleton, J.J., J.E. DeVay, and C.L. Elmore, Eds. (1998). *Soil Solarization and Integrated Management of Soil-borne Pests*. *FAO Plant Production and Protection Paper 147*, United Nations, Rome. 680 pages. Order online at <http://www.fao.org/catalog/giphome.htm>

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