Solarization: A Wonderful Non-Chemical Method for Controlling Pests in your Garden

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The intense heat that we all complain about during the summer months creates the perfect opportunity to solarize our gardens and landscapes. The method involves heating the soil by covering it with clear plastic for four to six weeks, allowing the sun's radiant energy to be trapped in the soil, heating the top 12 to 18 inches. When properly done, the top layers of soil will heat up to as high as 140 degrees Fahrenheit, temperatures that are lethal to a wide range of weeds, weed seeds, disease-causing organisms (pathogens) and nematodes.

Naturally, the effect of solarization will be greatest at the surface of the soil. Organisms found in the first six inches are controlled the best with decreasing effectiveness at deeper soil levels. Although some pests may be killed within a few days, it usually takes 4 to 6 weeks of exposure to full sun during the summer to ensure control of many others. July and August are ideal months for solarizing, although a month or so earlier or later can work if the weather stays warm.

The degree to which various pests can be controlled is related to the intensity, depth and duration of the elevated soil temperatures, as well as the sensitivity to treatment of your target pest. Soil solarization controls many of the annual and perennial weeds in California. Annual bluegrass, annual sowthistle, henbit and pigweed, along with many others weed species, are susceptible to solarization. But, solarization is not going to be as effective with weeds that have deeply buried root structures (corms, tubers and rhizomes) that can reprout. Rhizomes of bermudagrass and johnsongrass may be controlled if they are close to the soil surface. Control of purple and yellow nutsedge, as well as field bindweed arising from rhizomes and some clovers, can be inconsistent.

Fungal and bacterial diseases, including those that cause Verticillium and Fusarium wilt, Phytophthora root rot and damping off are effectively controlled by solarization. Nematode populations may be reduced by solarization, especially in the upper 12 inches of soil, but because nematodes are relatively mobile they can move deeper into the soil escaping the heat. For a detailed list of pathogens and pests controlled by soil solarization go to https://vric.ucdavis.edu/pdf/soil_solarization.pdf

Studies have shown solarization improves soil structure and increases the availability of nitrogen and other essential plant nutrients. While beneficial organisms may also be killed in the process, they tend to return more rapidly than the harmful ones. As for earth worms, they are able to wiggle away to deeper soil avoiding the sun's lethal effects.

Ready to start your soil solarization project? Here's how to ensure success:

Soil Preparation: Cultivate and remove plant matter. Level and smooth the bed so that the plastic will fit snuggly against the soil, without any air pockets. If solarizing on a slope, a south or south-west exposure is recommended for maximum pest control. For raised beds, it is best if they run north-south instead of east-west to ensure the edges receive direct sunlight.

Irrigate the Soil: For best results, wet the soil to at least 12 inches deep. In larger areas, it is easiest to do this prior to laying the plastic. You can irrigate after the plastic has been placed if irrigation lines are in place. Do not let the soil dry out before placing the plastic.

Plastic Tarp Choice: Transparent or clear plastic is most effective for solarization, as the heating rays from the sun will pass through the sheet and be trapped to heat the soil below. Black plastic will get hot on the surface but will not allow sunlight through to heat the soil below. Tarp thickness comes in 1 to 4 mils—all workable. The thinner plastic provides greater heating but may be more susceptible to tearing and movement in wind gusts. Those with UV inhibitors are less likely to break down. "Painter's" plastic, which comes in 1 to 4 mil rolls, is widely available from hardware stores.

Plastic Tarp Placement: The plastic must be held as tightly as possible against the soil. One way to hold it down is to dig a trench 4 to 6 inches deep around the area to be solarized. Lay the plastic out over the area with one edge to the trench. Cover that edge with soil (rocks, bricks or wood may also be used) to hold it down. Repeat on the other sides being sure to pack the soil down around the edges of the plastic. The closer to the soil surface the plastic is, the better the heating.

Solarizing Period: While 4 to 6 weeks of soil heating during the warmest time of year is usually sufficient, it may be necessary to leave the plastic in place for up to 8 weeks. The goal is to maintain daily maximum temperatures in the top 6 inches of soil at or above 110 to 125 degrees Fahrenheit. A soil thermometer can be used to verify achievement of these temperatures.

After solarization, the plastic may be removed. Take care not to disturb the underlying soil to avoid bringing up viable weed seeds from the deeper layers. The area can be planted immediately with seeds or transplants for a fall or winter crop.

Testing the Process: Master Gardeners, working at the Heritage Rose Garden, tried soil solarization on one of the newly formed raised beds—all initially covered with weeds. Since it was done somewhat "on the fly", a smaller and thinner tarp was used than what is recommended for success. After four weeks, the plastic started to break down and had to be removed before it disintegrated further. After a month or so, we noticed far more weeds had returned to other beds while the one we solarized was mostly weed-free. Had we used a larger and thicker tarp, we may have seen even better results.

Solarization is truly a convenient way to control soilborne pests without using harmful chemicals. It is a simple, organic technique that not only controls a wide range of pests but also

improves soil health; plants often grow faster and produce both higher and better quality yields when grown in solarized soil. This summer may be the perfect time to try this technique—just in time for planting your fall garden.

References:

Soil Solarization for Gardens and Landscapes, Pest Notes, Publication 74145, May 2019
http://ipm.ucanr.edu/PMG/PESTNOTES/pn74145.html

Soil Solarization, University of California Vegetable Research and Information Center
https://vric.ucdavis.edu/pdf/soil_solarization.pdf

Figure 1 Solarizing planting beds in a garden (UCDavis)