



Soil Solarization

Soil solarization uses the heat transmitted by solar energy through transparent polyethylene to kill soil-borne pathogens. Soil-borne pathogens and diseases are very difficult to control. Damping-off diseases, plant parasitic (root knot and others) nematodes, and weeds are often imported in soil amendments, transplants, and nursery stock. This may be prevented by using careful scrutiny when trading bulbs with neighbors and buying high quality products from reputable suppliers. In addition, the tools available to fight these soil-borne pests are being phased out for use by growers.

Sterilants such as methyl bromide were once used to sterilize nursery soils and propagation beds. This practice was questionable because it kills all living organisms in soil. In Arizona, we have no shortage of solar energy, so this technique can work well here. This technique is based on extensive research and following a few guidelines will greatly increase your success.

To solarize soil, all you need is a roll of clear polyethylene plastic. The best types come in 10-foot wide rolls and contain ultraviolet inhibitors. 2 to 4 mil thickness is most durable. The first step is to till the soil to a one foot depth, then rake it free of large clods, weeds and plant material. Be absolutely sure that the site is level, well-tilled, and smooth, providing maximum contact between the soil surface and the plastic.

The second step is to use a sprinkler or drip-line irrigation lines to saturate the soil to a depth of 3 feet or more. This can take hours, but it is essential for successful solarization. Next, dig a 6 to 8 inch trench around the plot, then wet the soil again. To lay the plastic, place one edge in a trench, then cover it tightly with soil. Stretch the plastic tautly over the site, then bury the remaining edges. Leave the plastic in place for at least six weeks, making sure the wind does not blow or lift the plastic, allowing heat and moisture to escape. The longer the plastic stays in place, the better. For maximum effectiveness, leave the plastic in place for 14 weeks between June and September.

The effect is obtained from the long-term increase of soil temperature at normal root depths. In some tests in California, temperatures of tamped soil 6 inches deep were 111° to 122°F, 14° to 23° higher than those of uncovered soil. This varies with soil texture, moisture, amount solar radiation, and other related factors. Root knot nematodes, including eggs, are readily killed when soil temperature exceeds 125°F for 30 minutes or 130°F for 5 minutes.

Remove the plastic in late summer or early fall. Do not cultivate the soil because that will bring viable weed seed back into the upper 2-3 inches of soil. Plant after removing plastic or cover the site with a weed and disease free mulch, then plant the following spring.

Combining organic amendments with soil solarization has also been shown to improve control of soil borne plant diseases. Here, volatile compounds released by the breakdown of organic materials enhance the effect beyond that of heat and steam alone. Remember, soil solarization does not completely kill the soil pathogens. It is a technique that can be used to give crop plants a competitive advantage, allowing them to survive and produce a crop in the presence of soil pathogens. It is also a sustainable practice and uses no synthetic pesticides. It is well worth trying in your garden.

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Adapted from original Backyard Gardener publications by Jeff Schalau, Agent, Agriculture & Natural Resources, University of Arizona Cooperative Extension, Yavapai County

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