

Soil Solarization: The Weed and Pest Armegggedon

James Stapleton

UC Statewide IPM Program

Kearney Agricultural Center



*Solve your pest
problems with
UC's best science*

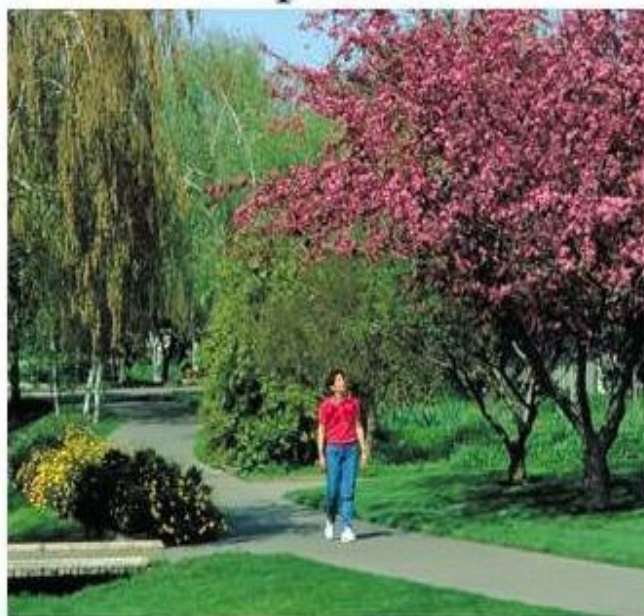
Announcements

- Upcoming workshops:
 - [Pesticide safety](#)
 - [IPM seminars](#)

What's New

- Green Bulletin
Newsletter: [August 2013](#)
- New pest in California:
[Bacterial spot on Almonds](#)
- Ag Pest Management:
[Walnut](#), [Citrus](#), [Alfalfa](#)
and [Asparagus](#) updated
- Pest Notes: [Eye Gnats](#)
added, [Fungus Gnats](#),
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- [More...](#)

Home, Garden, Turf & Landscape Pests



Agricultural Pests



Natural Environment Pests



Exotic & Invasive Pests





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Natural Environment Pests



Exotic & Invasive Pests



SOIL SOLARIZATION FOR GARDENS & LANDSCAPES

Integrated Pest Management for Home Gardeners and Landscape Professionals

Soil solarization is a nonchemical method for controlling soilborne pests using high temperatures produced by capturing radiant energy from the sun. The method involves heating the soil by covering it with a clear plastic tarp for 4 to 6 weeks during a hot period of the year when the soil will receive the most direct sunlight. When properly done, the top 6 inches of the soil will heat up to as high as 140°F, depending on the location. The plastic sheets allow the sun's radiant energy to be trapped in the soil, heating the top 12 to 18 inches and killing a wide range of soilborne pests, such as weeds, pathogens, nematodes, and insects.

The effect of solarization is greatest at the surface of the soil and decreases at deeper soil depths. The maximum temperature of soil solarized in the field is usually 108° to 131°F at a depth of 2 inches and 90° to 99°F at 18 inches. Control of soil pests is usually best for organisms found in the upper 6 inches of earth.

Solarization leaves no chemical residues and is a simple method appropriate for the home gardener or the large scale farmer (Fig. 1). It can improve soil structure by increasing the availability of nitrogen and other essential nutrients for growing healthy plants, as well as controlling a range of pests.

BENEFITS

Solarization during the hot summer months can increase soil temperature to levels that kill many disease-causing organisms (pathogens), nematodes, and weed seeds and seedlings. It leaves no toxic residues and can be easily used on a small or large scale garden or farm. Soil solarization also

speeds up the breakdown of organic material in the soil, often resulting in the added benefit of release of soluble nutrients such as nitrogen (NO_3^- , NH_4^+), calcium (Ca^{++}), magnesium (Mg^{++}), potassium (K^+), and fulvic acid, making them more available to plants.

Plants often grow faster and produce both higher and better quality yields when grown in solarized soil. This can be attributed to improved disease and weed control, the increase in soluble nutrients, and relatively greater proportions of helpful soil microorganisms.

Effectiveness on Various Pests

The degree various pests can be controlled is related to the intensity, depth, and duration of the elevated soil temperatures. Although some pests may be killed within a few days, 4 to 6 weeks of exposure to full sun during the summer is required to ensure control of many others. See UC ANR Publication 21377 in References for more information about solarization and specific pests controlled.

Fungi and Bacteria. Solarization controls many important soilborne fungal and bacterial plant pathogens, including those that cause Verticillium wilt, Fusarium wilt, Phytophthora root rot, Southern blight, damping off, crown gall disease, tomato canker, potato scab, and many others. A few heat-tolerant fungi and bacteria are more difficult to control with solarization.

Nematodes. Soil solarization can be used to control many species of nematodes. Solarization for nematode control is particularly useful for organic and home gardeners. However, soil

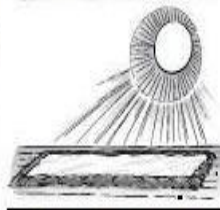
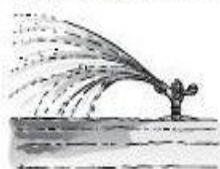


Figure 1. Follow these four steps to solarize your soil: cultivate and remove plant matter; level and smooth the soil; irrigate; and lay a clear tarp on the soil surface for 4 to 8 weeks, depending on local conditions.

PEST NOTES

Publication 74145

University of California
Agriculture and Natural Resources

October 2008

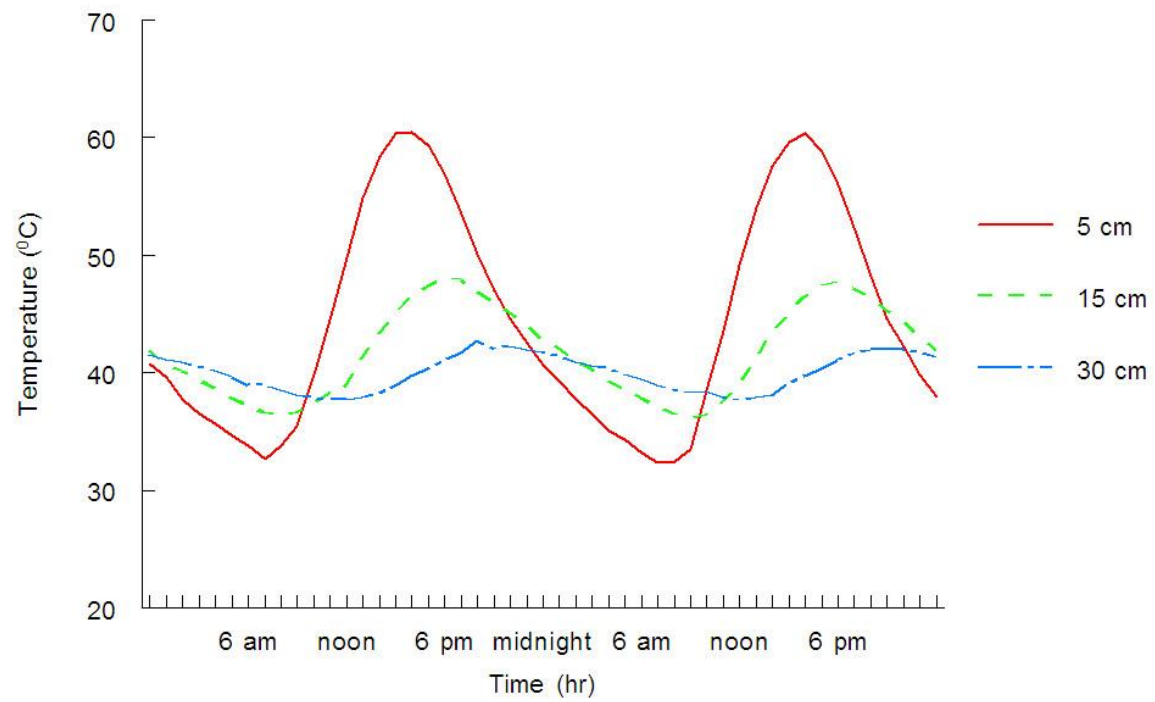


**Solarization and
Biosolarization are NOT soil
sterilants. Treatment does
NOT kill all life in soil:**

“Selective Disinfestation”


Mode of Action:

- * Physical**
- * Chemical**
- * Biological**



A dark, grayscale photograph of a rural landscape. In the foreground, a tractor is visible in a field, with two people standing nearby. The background shows a line of houses and trees under a dark sky. The overall tone is somber and agricultural.

**Why use
solarization?**




*** Non-chemical
alternative for broad-
spectrum treatment**

*** Cost**







**How can
solarization be
used?**

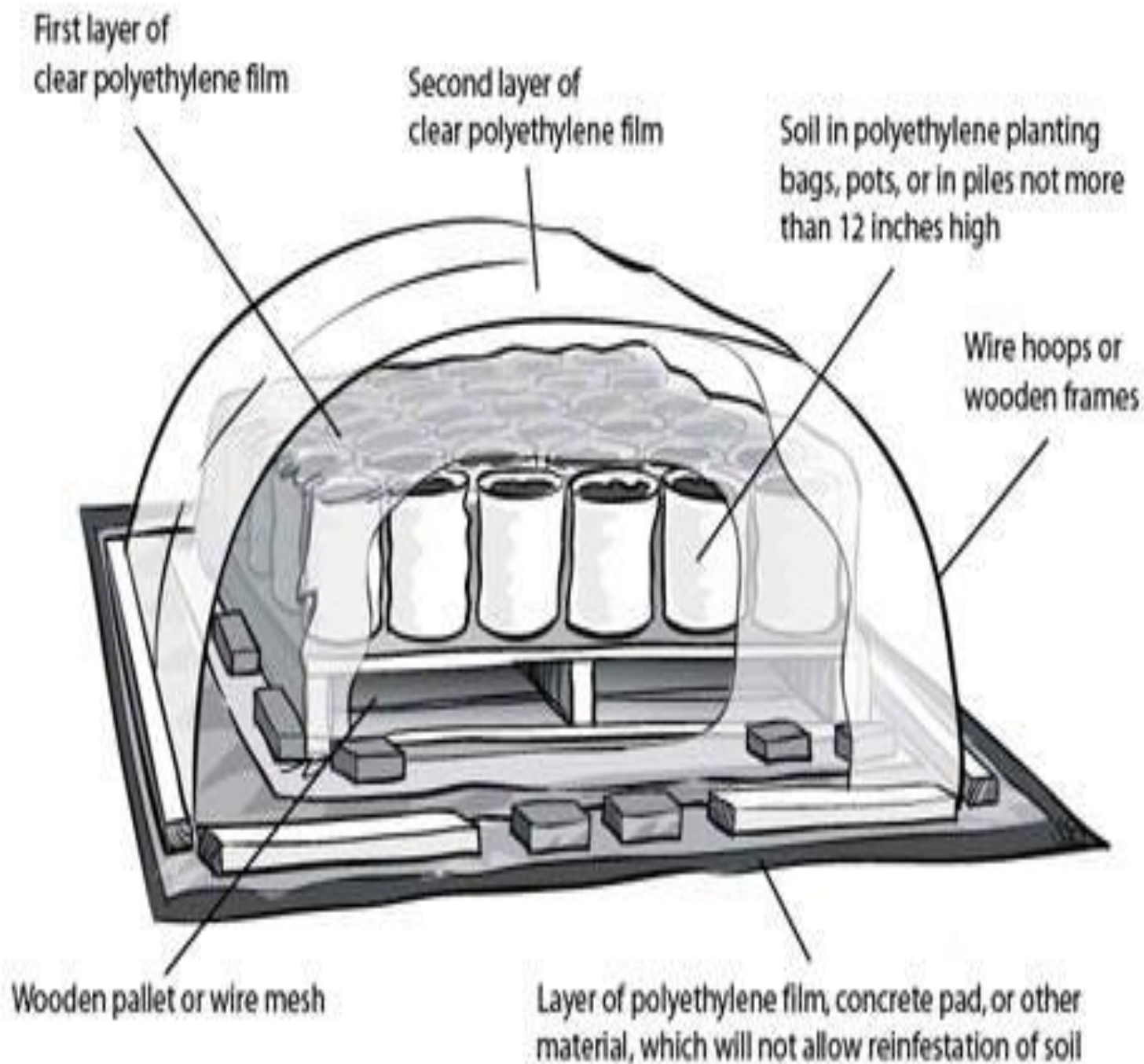


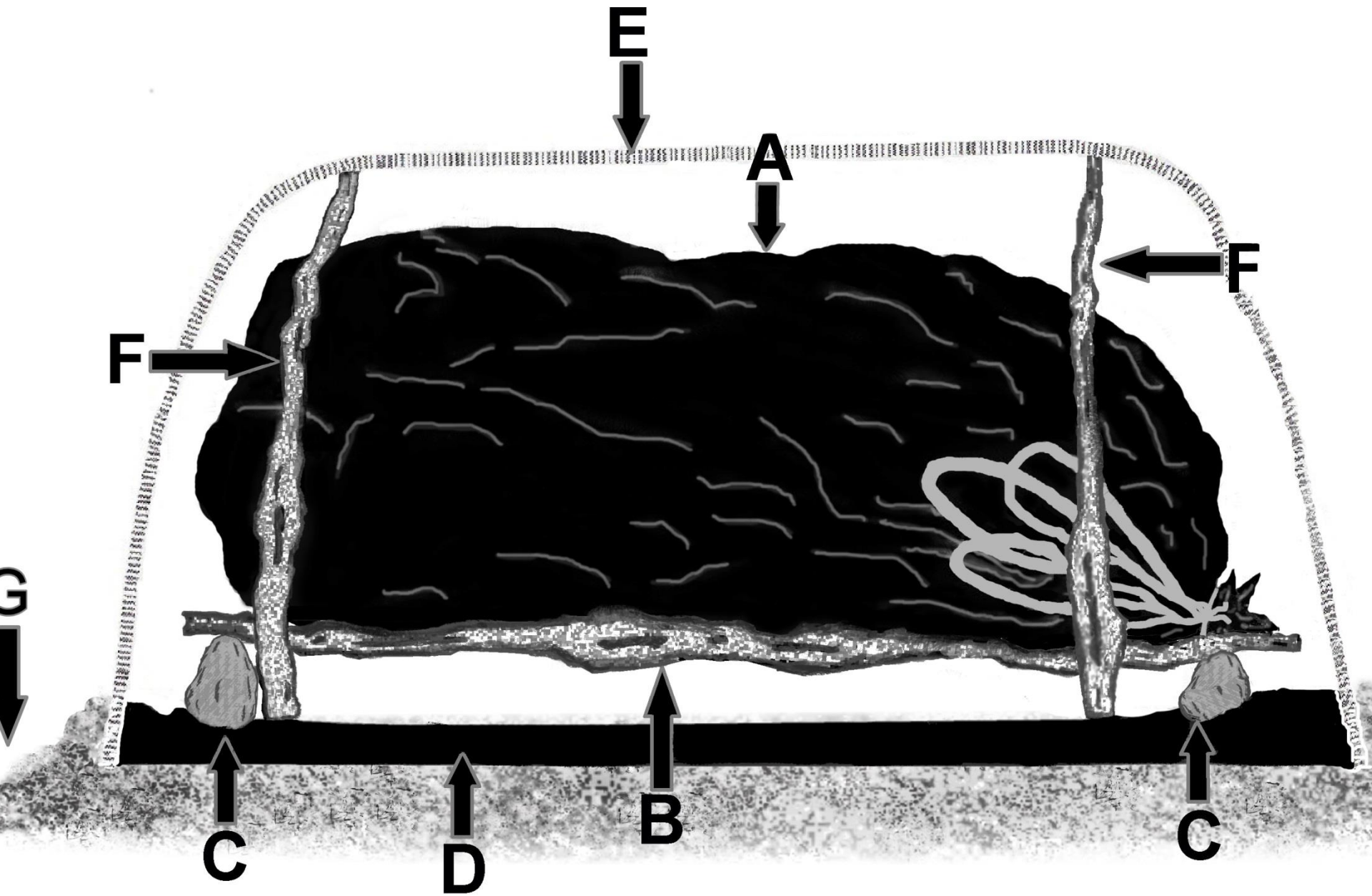




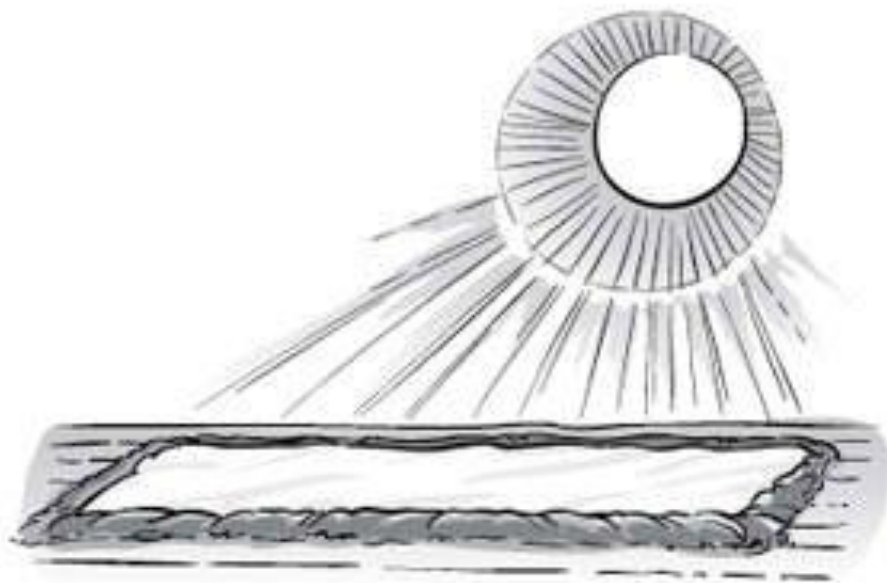
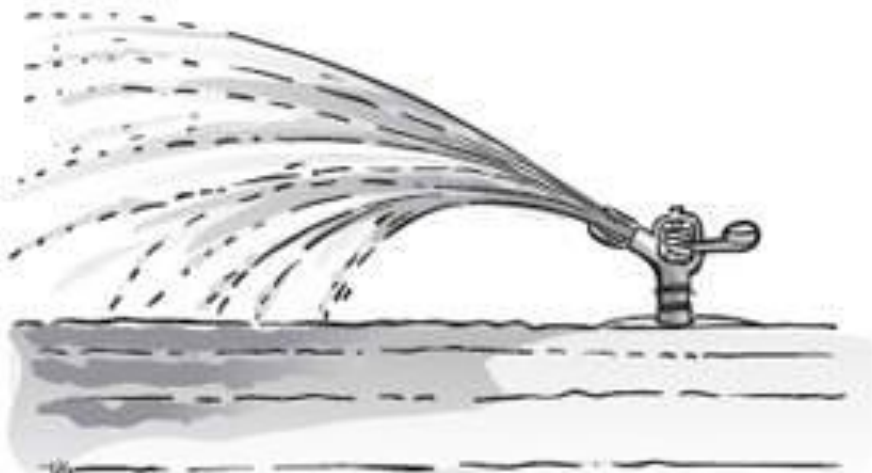






















**What are the
limitations?**

- **Ground out of production during summertime**

- * **Some resistant weeds**

- * **Learning curve**



Solarization is knowledge-based
technology:

**What new
information is
being developed?**



SOIL BIOSOLARIZATION

To achieve two different modes of action (heat; OM decomposition):

- Reduce/eliminate soil pest organisms; retain/promote beneficial microbial community**
- Aim for aerobic process; can be micro- or anaerobic**

ANAEROBIC SOIL DISINFESTATION (ASD)

- **Maintain high moisture,
low oxygen conditions in soil**
- **Impose reductive, fermentative
conditions to inactivate pests**
 - **In part,
by production of organic acids**

A microscopic image of soil bacteria, showing several rod-shaped cells with flagella, set against a dark, textured background.

For Soil Biosolarization We Use:

Finished, plant-based composts

and

**Crop and Food Processing Solid
Wastes**

Be aware of possible

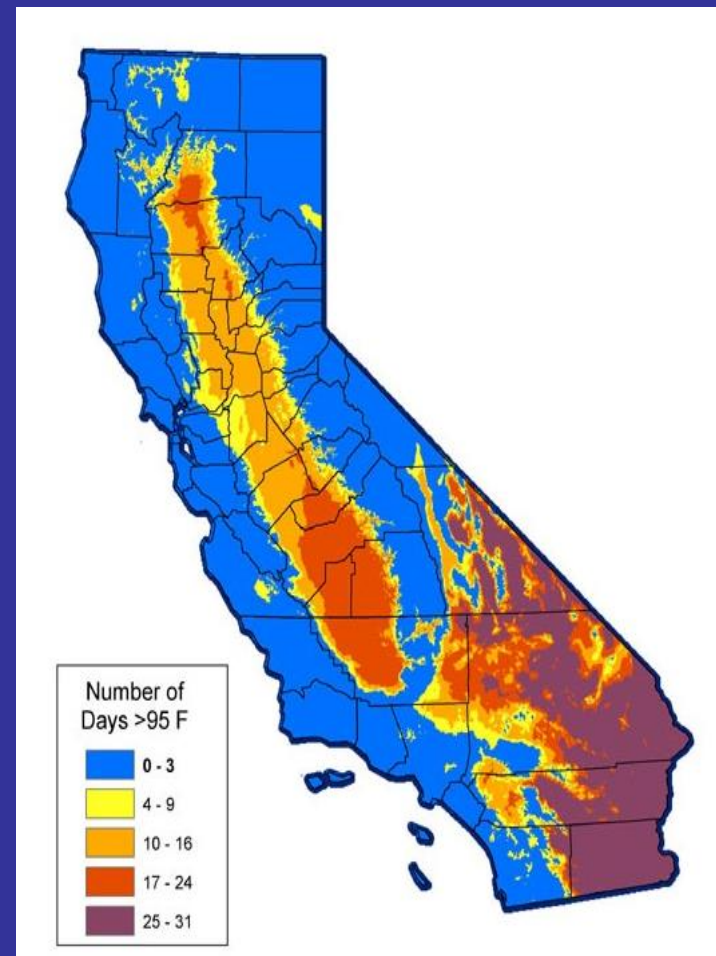
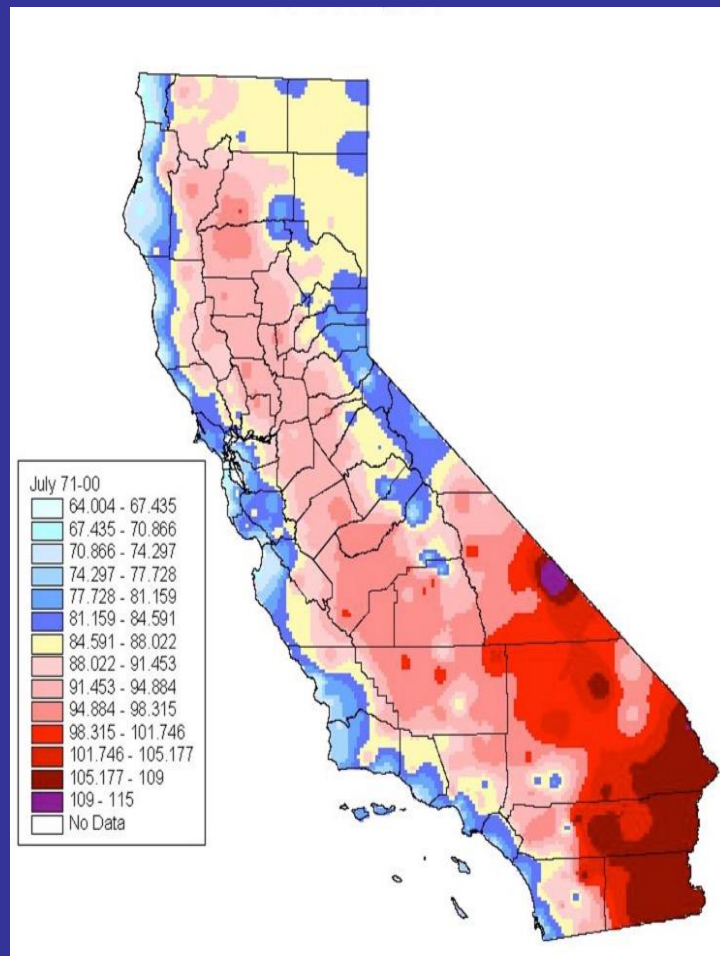
Phytotoxicity

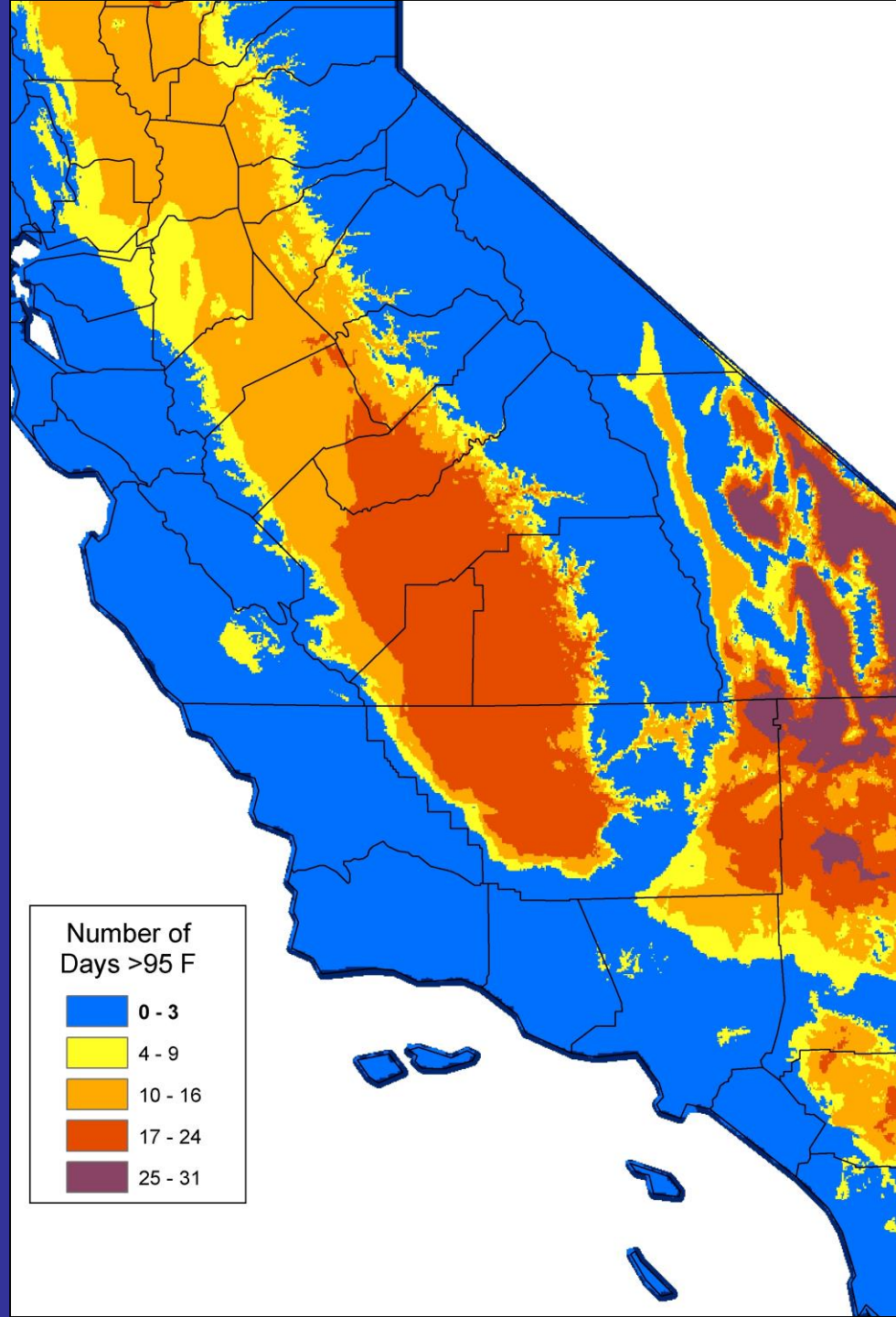
(allelopathy)

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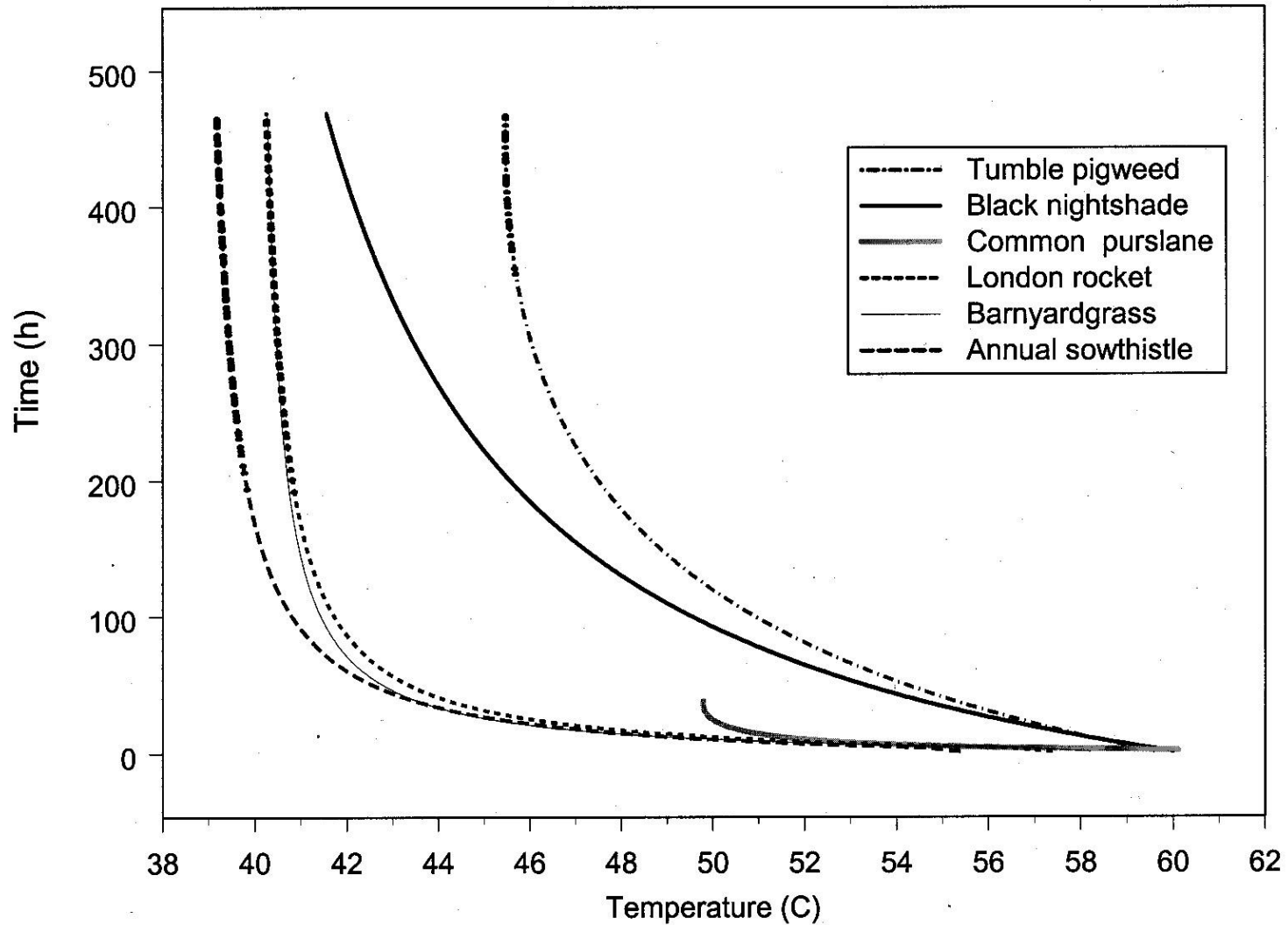


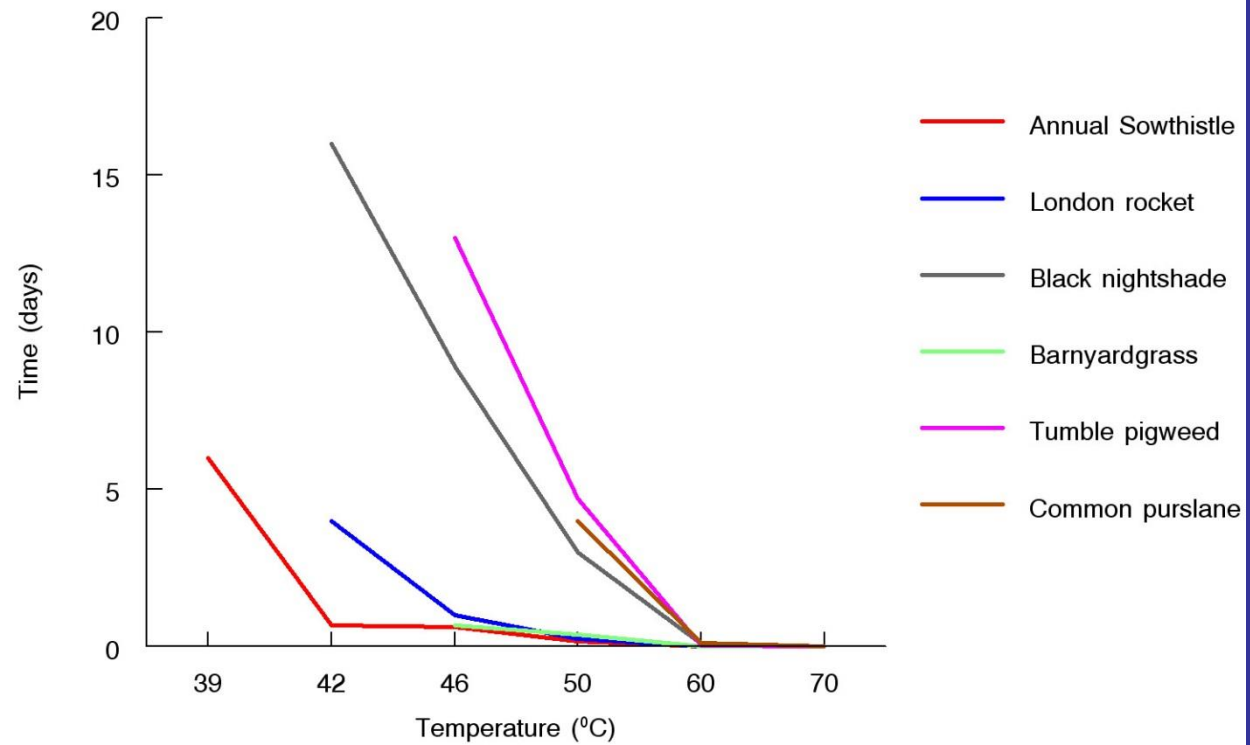
Helpful Tools





Hours to 90% mortality vs. temperature





UC Solarization Website:

**ucanr.org/sites/
Solarization**

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