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## SOIL SOLARIZATION

Jay Warner, Nevada County Master Gardener

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My hillside home came with a very healthy stand of Hypericum—St. John's Wort. While excellent for erosion prevention, it had gotten out of hand and needed to be controlled. I preferred an environmentally sound solution. So why not try soil solarization? Free sun, no chemicals, great!

Soil solarization is a method of integrated pest management (IPM) to control soil-borne pests such as diseases, weeds & their seeds plus insects. It harnesses the power of the sun to control pests without using harsh chemicals. The process may take a little longer but it is very effective, safe and inexpensive.

My requirement was simply to rid an area of unwanted plant growth. Solarization has several benefits beyond weed and disease control. It can improve soil structure as the organic matter decomposes. It also may help good insects and beneficial soil microorganisms thrive. Solarization attempts to kill weeds and most seeds to prevent future growth. High heat renders the seed not viable. Some seeds are hardy and resistant and may need further control methods.

Weeds and invasive species that spread by deep-root rhizomes can be controlled. Nuisance plants like oxalis, bindweed, bamboo, and yes, hypericum can be kept at bay. These tougher species may not be killed by solarization, but it will help you manage their growth. A second treatment is more effective, too.

Disease or pathogens found in the soil such as *Fusarium*, *Verticillium*, and root rots can be eradicated. This is a huge plus for the home vegetable gardener. These soil pathogens can wipe out your tomato and eggplant bounty. Again, the heat kills the bacteria. The commercial interest in suppression/eradication of soil borne pathogens is fueling the research. Universities like UC Davis and others around the country with agricultural programs provide the core research base. In the years to come, expect to hear more methods and ideas.

While this process kills many pest found in the soil, it does not eradicate all beneficial organisms. Some can survive the heat. Others will re-colonize afterwards when they have little competition. Earthworms dig a little deeper to escape the heat. They will return once the process has finished.

This method makes for faster growing and a higher quality crop yield. After solarizing the soil, your plants no longer have to compete with weeds for food, space, and water. Diseases are under control. The soil can more easily release nutrients like nitrogen, calcium, and magnesium. These important nutrients are now available to the plant. A complete win-win for higher yields in the garden. For a more in-depth discussion on solarization and its effects on specific pests, see UC ANR Publication 21377. More information can be found in the References below.

Now we understand what solarization does to improve our garden soil.

### So how do we get started?

First, I cleared the area of small rocks, weeds and other debris to allow the sun to hit as much soil as possible. This also makes a smoother "application" of the plastic. Now, gather your ingredients: Plastic, Water, Sun, and Time.

After a little research, I chose 2 mil plastic tarps for the job. Clear, not black plastic. The thinner the plastic, the more effective the method, but 1 mil is just too fragile. A good paint or hardware store will get you set up.

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Gardeners in cooler or shadier spots can use a double layer of plastic to increase the heat by 5-10 degrees. A double layer requires airspace between the two tarps. Plastic PVC pipe is excellent for this. Recent research suggests using bubble wrap as an effective double layer solarization tool. (*Maybe a swimming pool cover?*)

Secure the plastic to the ground. I fashioned some "U" shapes from clothes hangars and pushed them through the plastic, into the soil. You can use rocks or whatever is available. Some methods suggest digging a trench around the plastic and burying the edges of the tarp with the dirt. The point is to keep as much heat trapped under the plastic as possible.

Water is an important ingredient to the solarizing process. Wet soil helps conduct and hold the heat deeper than dry soil. Wet your soil to a depth of at least 12". You can do this by overhead watering before laying the plastic. Most home gardeners can water after putting the plastic down using a soaker hose. Place the soaker hose out, water overhead a little, and lay the plastic. Dampening the area first seemed to make it easier to handle the plastic sheets.

Now add a little sunshine. June through August is best. July is the optimal time in most of California for maximum light and heat. You are trying to get the top 2" of soil to 110–125 degrees. At 18" you want the temperature to be around 90-99 degrees. Raising the soil temperature to these levels is the most effective to achieve results. In some areas you may be able to achieve temperatures of up to 140 degrees. Soil thermometers are inexpensive and a good tool to monitor and insure success.

#### **How much time do you need to invest for best results?**

For our Northern California climates, 4 to 6 weeks is usually enough time with good sun exposure and warm air temperature. If you can take more time, it will not hurt. If we have a cool start to June, it may take longer to heat the soil up. In desert climates it generally takes less time. Alternately, it requires more time for mountainous or fog prone areas.

During this process, keep an eye on things. Make sure your area stays moist and the tarp in place. Look for tears caused by foot traffic (especially as the plastic begins to deteriorate) and repair any that you find.

After the solarization period, remove the plastic. Clean up any dead plant material. Now you have an excellent spot to do some fall gardening. Try not to disturb the underlying soil too much. It may distribute some weed seeds that the heat did not destroy. If you must cultivate the soil, try not to go deeper than 2". Raised beds also benefit from this process. For more information, refer to UC website: <http://ipm.ucdavis.edu/PMG/PESTNOTES/pn74145.html#SOLARIZING>, UC ANR Publication 74145.

#### **Will you need to repeat the process to maintain the benefits?**

The answer is very likely YES. An application of commercial herbicide or pesticide doesn't last forever. You can't expect solarization to either. I "rotate" my solarization just like my plantings. When an area needs a little help, it is taken out of that summer's production, solarized and readied for a great fall garden! For the benefits, it's not a bad trade off.

Solarization isn't environmentally perfect. Petroleum-based products and chemicals are used to produce the plastics. It leaves behind plastic waste for the landfill. It IS much safer for our health and the health of our neighborhood by avoiding chemical herbicides and fungicides. Solarization isn't 100% effective against all seeds and weeds. However, it is well worth the effort.

As for my situation, the hypericum is still around but there's a lot less of it. In the end, I feel better for having chosen a path with less impact on our environment.

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## References

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