Protecting container-grown plants

With proper care and handling of media and containers, growers can reduce threats posed by diseases, pests and weeds

CARRIE LEWIS

Heritage Seedlings has modified this insulated shipping container to use it as a chamber for pasteurizing used containers and propagation flats.

By Jennifer L. Parke and Carrie Lewis

Pests and pathogens are a threat for growers that produce containerized nursery stock. Growers can reduce these threats by considering the type of containers and growing media they use, where they are sourced, how they are handled, and how they are stored.

Bagged commercial potting media and bark used in the nursery industry are generally free from plant pathogens, insect pests, and weed seeds, as are perlite, horticultural vermiculite, and sphagnum peat moss, but "river-washed sand" is often contaminated with water molds. Make sure that sand is obtained from at least 2 meters deep and is not exposed to surface runoff water. Some types of peat can harbor soilborne pathogens (Mathre & Grey, 2002) and should be disinfested before use.

Properly composted plant material and animal manures may safely be used in potting media. Compost temperatures greater than 55°C (131°F) for 15-21 days are necessary for destroying most plant pathogens except for resistant viruses (Washington Organic Recycling Council, 2009). Certain composts have disease suppressive characteristics (Scheuerell et al., 2005). Request written assurance that the compost is free of contamination and/or that claims for disease suppression can be verified.

42 ▶

An ongoing series provided by Oregon State University in partnership with OAN

ADVERTISERS INDEX

Table 1.
Disinfectants for Pots, Tools and Equipment

Chemical Name	Trade Names
peroxide	ZeroTol, OxiDate, TerraCyte
quaternary ammonium	Physan 20, Green-Shield CA
sodium hypochlorite (bleach)	Clorox, Agelor

Disinfest containers before re-use

Re-using containers is a good idea for reducing costs, saving energy, and reducing waste, but it is very important to not recycle pathogens and weeds. Always disinfest containers before re-use.

Some nurseries submerge used containers in large vats of hot water. Treatment for 30 min at a minimum temperature of 180° F (Baker, 1957) is needed to kill most pathogens.

Chemical disinfectants can also be used to sanitize containers before re-use (see Table 1, above). Pots must first be washed to remove media and debris before soaking them in a disinfectant because these products are quickly inactivated by organic matter. The effectiveness of disinfectants is also influenced by exposure time, concentration, and the type of substrate being treated (Copes, 2004).

Some growers are experimenting with solarization to disinfest pots. Pallets of pots are covered with clear plastic and either left in the sun for several weeks or placed inside empty, closed greenhouses during a few weeks during the summer. Although this method has potential, the specific requirements for effective solarization are not known.

Most plant pathogens are killed by exposure to aerated steam at 140° F for a minimum of 30 minutes (See Fig. 1, at right). Higher temperatures are required to kill weed seeds (Baker, 1957). Steam can be supplied by a steam generator or a steam boiler. There are a few models of each available commercially.

Growers can set up their own steaming operation by building or modifying a container or room that can be used to house the pots during the steaming process. It is important that it be insulated, of an appropriate size, and be easy to load and unload.

It is important to achieve sufficiently high temperatures, even in the center of the stack of pots. Monitor the temperature with a digital probe thermometer or a "button" datalogger; a barbeque thermometer with the probe inserted inside the stack also works well and provides an instantaneous readout. Begin timing the 30-minute exposure time once the temperature reaches 140° F.

Most containers are composed of blends of different plastics, and not all nurseries have the same type of pots. Therefore, each grower will need to tailor their steam operation to their pots. Some systems offer ways to monitor and control the temperature to prevent pots from melting (see below).

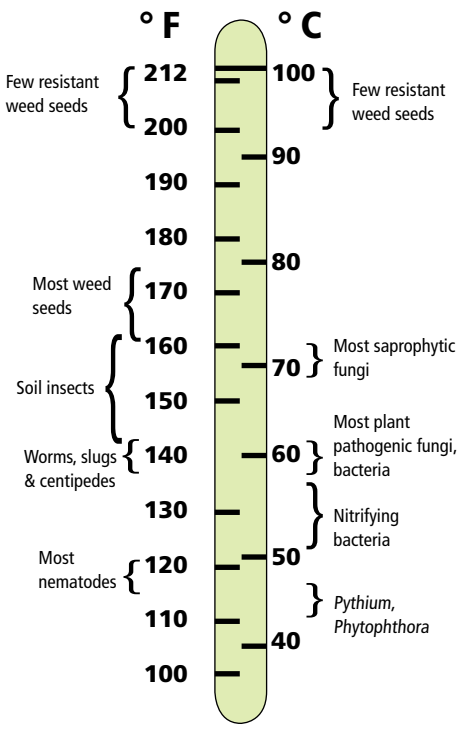

Fig. 1 Temperatures required to kill various kinds of soil microorganisms based on a 30-minute exposure to moist heat. Modified from Baker, K. F. & Cook, R. J. (1974).

If you aren't set up to steam-treat pots yourself, there are commercial enterprises that will come to your site and do it for you (see photo on Page 44). Most growers who steam treat their pots do so to get rid of soilborne pathogens, but many growers report substantial cost savings for labor and herbicides because of the excellent weed control achieved with steam treatment of pots.

Disinfest media before re-use

Pasteurization of used media can be accomplished by a cart system or a conveyor belt system. Commercially available soil carts can hold from 1/2 to 2 cubic yards, or a grower can fabricate their own. Each load is filled with media, covered with a tarp and pasteurized.

A conveyor belt system can treat up to 1 cubic yard of soil in an hour. Because the conveyor belt system can run continuously, it is ideal for processing large volumes of media.

There are many benefits of using aerated steam for pasteurizing media or soil. Air mixed with the steam is the most effective way of controlling the temperature (Baker, 1957), which is more critical than when steaming pots.

Aerated steam can be produced with an in-line aerator, or with a blower attached separately to the cart. Before pasteurization, media should be at a moisture content desirable for planting.

Fill the cart with the medium, or fill trays or pots with the medium to be pasteurized and place them in the chamber. Place a temperature probe in the coldest part of the pile. Close the chamber and begin the 30 minute timing once the temperature has achieved 140° F.

It is not desirable to sterilize the medium, because beneficial microorganisms are also eliminated (Baker and Cook, 1974). Potting medium chemical properties can also be negatively affected.

44 ▶


CARRIE LEWIS

Mobile steam pasteurization units offer an economical method for small volume growers to disinfest their containers that are used in production.

Safer storage and handling

Now that your containers and media are clean, you need to keep them that way! Potting media components and new or disinfested containers must be stored and handled in such a way that they do not become contaminated before use.

Ensure that media components are mixed and stored on a cement slab, not on soil. Thoroughly clean the slab or media bay between lots. Prevent runoff water from cull piles, roads, and growing areas from contaminating the stored media.

Regularly clean vehicles, tools, and mixing equipment to prevent contamination of media. Avoid using vehicles and equipment used in the field operation for handling media. Keep all pots off the ground, away from soil and contaminated water, and covered to prevent dust accumulation.

Putting these practices into use at your nursery will help reduce disease, pest, and weed problems and they will reduce your risk of passing on problems from one crop to the next.

Disclaimer

Chemical names and trade names are included as a convenience to the reader. Their use in this publication does not imply endorsement, nor discrimination against similar products or services not mentioned.

Dr. Jennifer L. Parke is an Associate Professor (Senior Research) in the Department of Crop and Soil Science at Oregon State University. She can be

reached at jennifer.parke@oregonstate.edu. Carrie Lewis is a faculty research assistant in the Department of Crop and Soil Science at OSU.

REFERENCES

Baker, K. F., ed., 1957. *The U.C. system for producing healthy container-grown plants.* Manual 23. Calif. Agri. Expt. Sta. Ext. Service. 332 pp.

Baker, K. F. & Cook, R. J., 1974. *Biological control of plant pathogens.* W. H. Freeman and Co., San Francisco. 433 pp.

Copes, W.E., 2004. Dose curves of disinfestants applied to plant production surfaces to control *Botrytis cinerea. Plant Dis.* 88:509-515.

Mathre, D.E. & Grey, B., 2002. *Naughty peat: a case study in plant pathology, with emphasis on Koch's Postulates and disease etiology.* http://www.apsnet.org/edcenter/instcomm/TeachingArticles/Pages/NaughtyPeat.aspx

Scheuerell, S.J., Sullivan, D.M. & Mahaffee, W.F., 2005. Suppression of seedling damping-off caused by *Pythium ultimum, P. irregulare,* and *Rhizoctonia solani* in container media amended with a diverse range of Pacific Northwest compost sources. *Phytopathology* 95:3,06–315.

Washington Organic Recycling Council, R., 2009. Best management practices: guidelines for pathogen control at organic material processing facilities. www.compostwashington.org.