



Greenhouse Pest Message, December 20, 2021

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Now is a good time to continue cleaning projects. With the continued supply chain issues, many of you may be cleaning and re-using plastic containers. Containers that need to be re-used should be washed thoroughly to remove organic debris and media particles before treating with a commercially available disinfectant.

The smaller the container that harder it is to effectively remove organic debris. For example, very small plug trays would be more difficult to clean than larger plug trays. Plant trays should also be cleaned and disinfected before re-use.



Plug trays should be cleaned and disinfected before re-use.

Fungal pathogens that cause root rot diseases such as *Rhizoctonia*, *Thielaviopsis*, *Pythium*, *Phytophthora*, and *Pythium* can survive in plant debris found in used pots and flats and cause root rot diseases. Of these root rot pathogens, *Thielaviopsis* is most challenging to eradicate because the thick-walled spores (chlamydospores) can survive long, dry periods.

Black root rot caused by *Thielaviopsis basicola* has a wide host range of over 120 species in 15 plant families. Calibrachoa, pansy, viola and vinca (*Catharanthus*) are some of the most common ornamental hosts. Petunia, poinsettia, verbena, geranium, diascia, fuchsia and snapdragon can also become infected. Herbaceous perennials are also susceptible including dicentra, hardy geraniums, heuchera, creeping and garden phlox. Woody plants such as boxwood, holly and elderberry can also become infected.

Use new trays and pots if possible; avoid using old flats unless they have been

steamed or disinfested by pre-rinsing in water and then soaking in fresh, diluted bleach solution or ZeroTol for a minimum of 10 minutes.

Thielaviopsis survives on reused plastic and is difficult to eradicate. If you are considering reusing pots, if possible, select plants less susceptible to black root rot for replanting and clean pots thoroughly with a disinfectant.

Dr. Colleen Warfield found that ZeroTol (at a rate of 2.5 fl. ounces per gallon) or a 10% solution of chlorine bleach was most effective as disinfectants for plug trays. <https://ag.umass.edu/greenhouse-floriculture/greenhouse-updates-may-8-2014>

Many growers use specific greenhouse cleaners such as Strip It Pro, which is a blend of acids, surfactants, and wetting agents to help remove organic matter and mineral deposits without scrubbing. Strip It removes mineral deposits such as calcium, magnesium and iron and attacks organic buildup from algae and hard packed soils. It must be thoroughly rinsed before drying and must not be applied directly on plants. It is labeled for use on pots and plug trays in greenhouses and nurseries.

After the pots are cleaned of organic matter and debris, you can then use a disinfectant. There are many different commercially available disinfectants developed specifically for greenhouse use. Carefully read the label of the product you are interested in using especially regarding safety considerations and for detailed instructions. PPE should always be worn when applying sanitizers.

Some commercially available sanitizing agents that mention their use on containers, flats or pots include Q salts such as Green Shield 11 and KleenGrow as well as Sanidate 5.0*, ZeroTol 2.0* Jet-Ag*, and PERpose Plus* (* organic products).

Green-Shield 11 (quaternary ammonium product or Q salt) is labeled for use on pots and flats. The label states it can be used to pre-clean surfaces and to ensure that surfaces remain wet for 10 minutes. GreenShield is labeled as a disinfectant for algae, fungal, bacterial, and viral plant pathogens. It lasts 4x longer in solution than bleach without the odor, and volatility of bleach.

KleenGrow (4th generation DDAC quaternary ammonium product or Q salt) (DDAC = didecyl dimethyl ammonium chloride) is labeled for use to disinfect surfaces such as plastic pots/trays to reduce the spread of fungal and bacterial plant pathogens.

Jet-Ag (hydrogen peroxide and peroxyacetic acid) is a strong oxidizing agent. Non-porous surfaces including pots, flats and trays should be sprayed with Jet Ag until runoff. All solutions need to contact surface for 10 minutes.

PERPose Plus (hydrogen peroxide/hydrogen dioxide) is a strong oxidizing agent that may be used as a fungicide and algacide in conjunction with a foaming agent on pots. Remove all plant debris. Spray until run-off.

Sanidate 5.0 (hydrogen peroxide and peroxyacetic acid), is a strong oxidizing agent. Pots, flats, and trays may be soaked in a dip solution to ensure complete coverage. All surfaces should remain wet for 10 minutes. It suppresses algae, fungi, viruses, and bacterial growth.

ZeroTol 2.0 (hydrogen peroxide and peroxyacetic acid) is a strong oxidizing agent. For pots, flats and trays, spray until runoff. Allow surfaces to remain wet for 10 minutes. Effective against algae, bacteria, and fungi.

Clorox bleach (sodium hypochlorite) is labeled for on containers and pots in nurseries, but it needs to be used with **caution**. It is highly volatile, and can irritate skin, eyes, and lungs. It should only be used in a very well-ventilated area. Never mix bleach with products containing ammonia or acidic products. Repeated use can be harmful to plastic and metals, as it is very corrosive. Pots need a contact time of 10 minutes. Mix fresh solutions before use. The half-life (the time required for 50 percent reduction in strength) of a chlorine solution is only two hours. After two hours, only one-half as much chlorine is present as was present at first. Effective against algae, bacteria, fungi, and viruses.

For more on concerns on both human and plant health with the use of chlorine bleach (as a surface disinfectant in greenhouses), see: http://e-gro.org/pdf/2015_406.pdf

Cleaning and Sanitizing Commercial Greenhouse Surfaces University of Kentucky <https://plantpathology.ca.uky.edu/files/ppfs-gh-07.pdf>

Cleaning and Disinfecting the Greenhouse UMass Extension <https://ag.umass.edu/greenhouse-floriculture/fact-sheets/cleaning-disinfecting-greenhouse>

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