

## Appendix 7:

### Sanitation & Disinfection Guidelines

#### Nursery Sanitation Guidelines

Sanitation is an important component of a nursery's *C. buxicola* biosecurity program. The nursery shall assess its risks on its site, considering traffic, visitors, the number of host plants and the type of business. After examining the risks, the nursery shall determine which type of biosecurity and sanitation is appropriate for its site. Biosecurity and sanitation details shall be recorded in the Phase 1 Nursery Manual. Nurseries will be audited based on what is written in the Phase 1 Nursery Manual.

Not all of the guidelines and treatments listed below will be necessary or appropriate on your nursery. Select those that reduce the risk of introduction and spread of *C. buxicola* at the nursery. Nursery sanitation guidelines:

1. Propagating from clean boxwood and pachysandra stock plants;
2. Assessing risk for re-using pots and trays. Reused pots and trays should be cleaned and disinfected.
3. Preventing storage of potting media on bare soil
4. Limiting the use of compost produced on the nursery in growing media until further research shows at which temperature and duration *C. buxicola* is killed. Do not compost debris from symptomatic plants.
5. Preventing spread of infected plant debris on workers, vehicles, equipment, tools, and on production beds between crops;
6. Collecting fallen boxwood and pachysandra leaves from production, restricted, and isolation areas for disposal;
7. Removing debris from surfaces (container beds, benches, wagons, etc.) to greatly reduce the risk of *C. buxicola* spread.
8. Off-loading shipments in an area that can be cleaned. Leafy debris must be cleaned up, bagged, and disposed of as noted in the Phase 1 Nursery Manual;
9. Preventing the spread of infected plant debris from the cull pile to production areas.

#### Disinfection of Surfaces:

Sometimes a nursery may choose to more rigorously sanitize a surface. This can be achieved with the application of a disinfectant. Disinfectants are oxidizing agents that kill microorganisms.

- Prior to disinfecting a surface, it is critical that it is free of soil and organic matter.
- Always clean and rinse soiled surfaces prior to applying disinfectants.
- Textured surfaces will require additional cleaning.
- It is also important to remove inorganic salt deposits because they can shield spores from the disinfectant.
- An acid-based cleaner will be necessary to remove salt deposits.

Some common disinfectants used at nurseries include alcohols (e.g. ethanol, methyl hydrate, isopropanol), halogens (e.g. chlorine bleach), peroxides (e.g. Hyperox®, Virkon®), and quaternary ammonium (e.g. KleenGrow, Virocid®). All of these disinfectants are fast-acting, broad spectrum and low toxicity biocides. There are a number of factors to consider when selecting a disinfectant. Some of these factors are presented in Table 1.

Other factors to consider are safety to workers and the environment. Disinfectants can irritate eyes, skin and/or mucous membranes. Use safety equipment recommended on the label when mixing, loading and applying disinfectants. Never mix bleach with ammonia or acidic solutions because these combinations will produce toxic chlorine gas.

**Table 1.** Factors to consider when selecting a disinfectant.

Chemical	Factors that Reduce Disinfectant Efficacy	Corrosive?	Residual Activity
Alcohol (70-75%)	Organic matter, too high of concentration	No	Low
Halogens (5-10%)	Organic matter, sunlight, high pH, temperatures below 20C	Yes, to metals	Low
Peroxides	Organic matter, sunlight	Moderate, to metals	Limited
Quaternary Ammonium	Soap, hard water (>400ppm Ca+2)	No	Good (9 day ½ life in soil)

### Disinfectants for Staff and Visitors:

Locate hand wash stations and foot baths at entrances to the facility, and to greenhouses and isolation blocks.

Hand wash stations - antimicrobial hand soaps (e.g. OneStep®, Purell® Hand Sanitizer) are a reasonable substitute for hand washing as long as the hands are not visibly soiled. These products usually contain alcohol in a quick-drying gel formulation (look for 70% active ingredient).

Foot bath or boot spray – a plastic tub lined with foam can be used as a foot bath. Put a lid on the tub to reduce evaporation and to prevent pets from consuming the disinfectant solution. There are also foot bath mats that can be purchased from a number of local agriculture suppliers. The foot bath will not be too effective on soiled footwear. Footwear should be exposed to the foot bath solution for at least 30 seconds.

- Virkon® (1% or 10 g/L) – change weekly; use test strips to measure disinfectant activity
- KleenGrow (1.5% or 15 g/L) – change biweekly; use test strips to measure disinfectant activity
- Hyperox® (0.8% or 8 g/L) – change solution daily or when soiled

**Dip Disinfectant Treatments for Tools/Cutting Knives:**

Check the label for appropriate time of exposure to the disinfectant and other application details.

- There are pruners on the market that automatically apply a disinfectant solution to the blades when a cut is made.
- 70% alcohol
- 10% household bleach (prepare by mixing 100 mL of bleach in 900 mL of water). Caution: bleach solutions are corrosive to metals.
- 0.1 or 0.2 % KleenGrow (mix 1 or 2 mL of KleenGrow per litre of water). Use the lower rate for plants that are sensitive to KleenGrow. Due to its long residual period, toxic levels of KleenGrow can accumulate on cutting tools. Periodically rinse the blades to remove the disinfectant residue
- 5% Virkon® (dissolve 50 g in one litre of water)

**Disinfection of Production Areas:**

- KleenGrow is the only disinfectant registered for use in greenhouses. Thoroughly wet the surface and do not rinse off. Use 8 mL of KleenGrow per litre of water for greenhouse surfaces and equipment. Use 30 mL of KleenGrow per litre of water for wood, painted and concrete surfaces.
- To disinfect container production areas, weed barrier may be treated with 10% bleach.
- Field production areas should be disinfected with heat (e.g. flame thrower), however, it is still recommended that the field should not be replanted with Boxwood and pachysandra for at least 5 years.

**Disinfection of Vehicles:**

- Clean the truck in a commercial vehicle steam-cleaning facility before returning to the nursery. Steam cleaning will significantly reduce the risk of *C. buxicola* propagules being present on the vehicle.
- KleenGrow - Pace Chemicals recommends applying KleenGrow at the rate of 4 mL per litre of water to disinfect the box of shipping vehicles. If there are plants in the box, the rate is to be reduced to 1 mL per litre of water.
- Virkon® - wash and rinse all surfaces of the vehicle prior to disinfection. Disinfect all vehicle surfaces inside and outside using a 1% dilution rate (= 1 mL Virkon® + 99 mL of water). The inside of the cab can be wiped down with a cloth soaked in Virkon®. (**From:** “Vehicle Biosecurity Procedure Checklist” produced by the manufacturer of Virkon®, Vetoquinol).