CHASE NEWS

Volume 6—Issue 7
July 2007

CHASE HORTICULTURAL RESEARCH, INC.

Re-circulating Irrigation Water Safely

Re-circulating systems include holding ponds that are used to collect, store and recycle runoff water. The runoff comes from watering crops in containers and even in-ground ornamental plantings in some locations. Research has shown that *Phytophthora* and *Pythium* are common in these collection ponds. Unfortunately, some species of these fungi can survive chlorination treatments. There are often higher levels of *Pythium* than *Phytophthora* and populations peak during seasons favoring each species (usually summer). There are a variety of ways to disinfest recycled irrigation water including: Ultraviolet radiation (at 254 nm), heat pasteurization (203F for 30 seconds) and oxidation with addition of chlorine, bromine, ozone or hydrogen peroxide. Bromine is not used to any degree although chlorine remains an important oxidizer in water treatment. The most recent oxidizer being introduced in the ornamentals industry is chlorine dioxide. It has not been widely adopted to date primarily because of the difficulty and safety of its use through specialized chlorine dioxide generators. The table summarizes key points for chlorine dioxide as it is of special interest currently.

Copes, Chastagner and Hummel tested safety and efficacy of both chlorine dioxide and hydrogen peroxide on some flowers and bedding plants. They found that at high pH (8) more chlorine dioxide is required to kill *Thielaviopsis basicola* and *Fusarium oxysporum*. Also, existence of copper, iron, manganese and zinc in the water reduce efficacy of chlorine dioxide in lower levels. Flowers appear more sensitive to hydrogen peroxide than to chlorine dioxide. Chlorine dioxide is relatively safe at 5-50 ppm, and even at 100 ppm it has been safe on most crops when applied 4 or 5 times on a 3-day interval. Hydrogen peroxide tested at 900-2700 ppm was also relatively safe.

Chlorine dioxide is also used to control algae in irrigation lines. Municipal lines often have algae and biofilm (a natural slime layer that acts to protect microorganisms from other chemical disinfectants). Selectrocide (comes in a dry packet) from Griffin can be used if injected as a stock solution. This product is used for shock treatment with 50 ppm or for prevention with a continuous treatment at 1 ppm. There are few really new choices in treatment of water or potting medium for algae and pathogen control. The basic ingredients remain oxidizers but the delivery methods are undergoing interesting developments with improvements in safety, handling and cost. Chlorine in the form of chlorine dioxide is the current focus. We have been testing a tablet form (Aseptrol from Whitmire Micro-Gen) and a chlorine dioxide generator from CH2O. It will be interesting to see how the newest products are adopted in our industry.

Chlorine dioxide

- Breaks down phenolic compounds – used to purify water
- About 2.5 times as active as chlorine – in terms of oxidative ability
- In water it breaks down when exposed to light

Advantages

- Compatibility with anionic and nonionic detergents
- Fast action
- Inexpensive
- Wide spectrum of activity

Disadvantages

- Inactivation by organic matter
- Corrosiveness
- Tendency to decompose – affected by temperature, light, metals, concentration and pH
- Falls apart faster as temperature increases
- Fastest decomposition at pH 5-6, slower above this level.
- Decreasing pH increases the efficacy in killing microbes

Inside this issue:

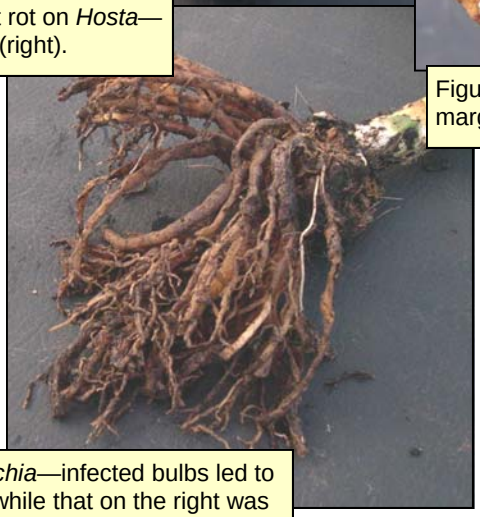
Symptoms of Pythium Root Rot

The most common signs of Pythium root rot are first seen on the upper portions of the plant. Wilting is often cited as a common symptoms but in many cases, yellowing (chlorosis) of older leaves or sometimes just the new growth (Figure 1), stunting and burning (necrosis) (Figure 2) on leaf margins are the first signs that Pythium root rot is present. If you take the time to knock the plant out of its pot you can see anything from dark black, mushy and sparse roots (Figure 3) to collapse (Figure 4).

Figure 1—Pythium root rot on *Choysia*—chlorosis of new growth (left).

Figure 2—Pythium root rot on *Camellia*—marginal necrosis on leaves (above).

Figure 3—Pythium (and other fungi) root rot on *Hosta*—roots are mushy, sparse and dark black (right).



One of the most commonly cited symptoms of Pythium root rot is the rot of the outer layers (cortex) of the root, leaving the central core. While this is stated as a sure indication that Pythium is the cause it is not specific to Pythium. It can occur with some other fungal root diseases or even in mixed infections with more than one pathogen. The bottom line is that you should get a lab to culture the pathogen involved in your specific situation. Without this information, you will be shooting in the dark with both fungicide and cultural controls. The lists to the right summarize both chemical and cultural methods to reduce Pythium root rot on ornamentals. Remember it is always more effective to avoid disease than the control it after the fact.

Figure 4—Pythium root rot on *Zantedeschia*—infected bulbs led to the root collapse of the plant on the left while that on the right was treated with Fosphite (see page 3 for the report) (below).

The products mentioned to the right are a very short list of those available for Pythium—check with your local extension service or fungicide distributor for other options.

Cultural Controls

- ❖Minimize water applied to the roots.
- ❖Increase greenhouse temperature.
- ❖Increase light level to optimal for the crop.
- ❖Use well-draining potting medium.
- ❖Use media wetting agents to improve drainage of excess water.
- ❖Use fans to improve general aeration.
- ❖Do not over-fertilize plants.
- ❖Do not use ebb and flood on plants that bare known to be sensitive to Pythium.
- ❖Use pathogen-free plants when possible.

Chemical Controls

- ❖Etridiazole (Terrazole, Truban and Banrot)
- ❖Fenamidone (FenStop)
- ❖Mefenoxam (Subdue MAXX)
- ❖Phosphonates (Aliette, Alude, Fosphite, Vital and many others)
- ❖Trichoderma (PlantShield HC)

Saving Plants from Pythium

We have been doing a series of trials on calla lilies and other bulbs using fungicides to prevent diseases. In some cases, the bulbs are infected when received, often making routine fungicide drenches beneficial. The most recent trials we completed were on calla lilies bulbs infected with Pythium. The pathogen was cultured before the trial and tested for possible Subdue MAXX resistance. In this case, the Pythium was still sensitive to this important fungicide so we included the product in one trial as the chemical standard.

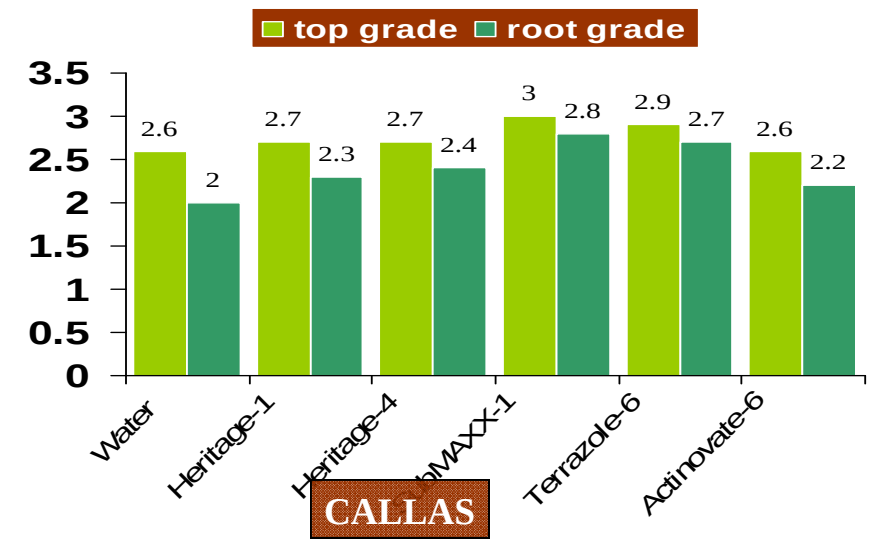
TRIAL ONE—CALLAS and PHOSPHONATES

In the first trial, we compared a series of similar products, the phosphonates. I have seen variable results with these products on Pythium so this was a good opportunity. Bulbs were planted on 10 April and the first drench was applied on 12 April. Drenches were applied (35 ml per 3.5 inch pot) every two weeks for a total of five applications. The treatments included: water, Fosphite (24 oz/100 gal), Aliette 80WDG (12.8 and 16 oz), Alude (64 oz), Vital (64 oz), pHortress (64 oz) and Subdue MAXX (1 oz).

We rated top grade (quality), the percentage of healthy roots and the percentage of rotted roots for the last time on 29 June. The graph to the right shows the results for the roots (healthy and rotted). It was obvious that the roots on the water-treated controls were very poor quality with almost 50% loss. In contrast, all of the phosphonates and Subdue MAXX provided a high degree of control of rotted roots without reducing the formation of healthy roots. The best control was seen with Fosphite, Alude and Subdue MAXX. The tops of these plants were also clearly affected by the Pythium root rot. The water control was significantly lower in quality than all other treatments showing stunting, fewer leaves and overall yellowing. These results show that phosphonates can be very effective for Pythium root rot.

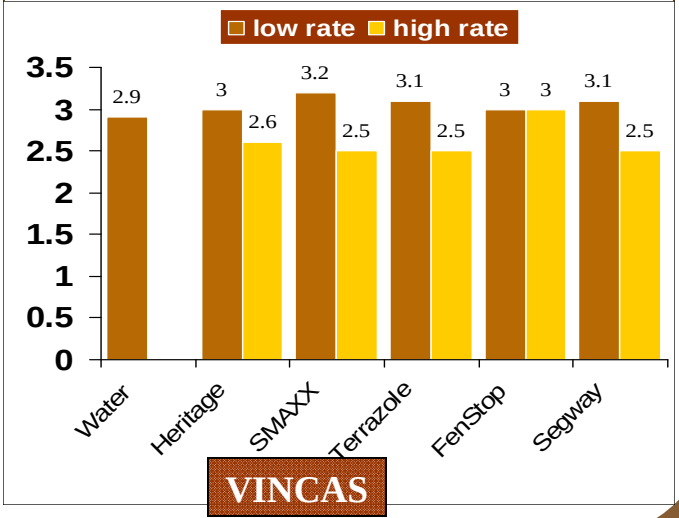
TRIAL TWO—CALLAS

We started a second trial on the same group of Pythium infected calla bulbs about a month after the first test. We used the same potting medium and the same size pots. The weather was warmer and we had very few signs of Pythium root rot even on the water controls. It appears that cultural control of Pythium is possible so improving the conditions to favor the crop allowed it to outgrow the Pythium without benefit of fungicides. Bad news for the trial but good news for growers.



TRIAL THREE—VINCAS

In May we started some vinca (*Catharanthus roseus*) for a summer trial on Phytophthora. The weather was too cool for vincas and we were suddenly faced with losing all of the plants to Pythium root rot. Faced with a dilemma common to many growers we decided to try some fungicides and see if we could stop the losses. Plants were drenched once on 23 May and rated for top grade (quality) on 6 June. We included Heritage (0.9 and 2 oz/100 gal), Subdue MAXX (0.5 and 1 oz), Terrazole 35W (3.5 and 6 oz), FenStop (7 and 14 oz), and Segway (cyazofamid at 1.5 and 3 oz). It was interesting that in most cases, the lower rate was more effective than the higher rate. This probably indicates some phytotoxicity at the higher rates. Once again—less is more. Unfortunately, none of the treatments was better than doing nothing. The change in weather was apparently more important than the use of a fungicide which in most cases reduced plant quality (higher rates).



Myrothecium Leaf Spot and Crown Rot

I have worked on Myrothecium since the early 1980's starting with foliage plants. When I started looking I found a long list of foliage plants that were attacked by *Myrothecium roridum*. This fungus was first discovered in the early 1900's causing petiole and crown rot on pansies. It has also been found on vegetables like tomatoes and peppers causing fruit decay. See page 4 for a partial list of ornamentals attacked by *M. roridum*.

In the late 1980's the production of new foliage plants using tissue culture methods led to a different symptom caused by the same fungus. Now we were seeing petiole rot on *Dieffenbachia*, *Syngonium* and *Spathiphyllum*, especially. The early fungicide work showed best control of leaf spot with chlorothalonil (like Daconil) and mancozeb (like Protect). When petiole rot became prevalent however, the best fungicides were iprodione (Chipco 26019) and triflumizole (Terraguard).

In 1996, I moved to California and we started to see Myrothecium on some new crops including many perennials and also an old crop—Pansy. Since then, we have performed a number of trials for control of Myrothecium mainly on pansy and New Guinea Impatiens. The table below shows the summary of our work on Myrothecium control conducted by our team between 1996 and the present.

Product	Degree of Control
Chipco 26019	Very good
Cleary 3336	Some to very good
Clevis	Some
Compass O	Some to good
Cygnus	Good
Daconil Ultrex	Very good to excellent
Eagle (Systhane)	Some to good
Endorse	Some
Heritage	Very good
Insignia	Very good to excellent
Junction	None
Medallion	Very good to excellent
Palladium	Very good to excellent
Phyton 27	None to very good
PlantShield	None to very good
Spectro	None
Terraguard	Very good

The Most Recent Trial

Earlier this month, we finished our most recent trial on pansy crown rot. 'Atlas Needlepoint' plugs were established in 3.5 inch pots containing Sunshine No. 1 and fertilized with Osmocote Plus 15-9-12 (3-4 month release). Fungicides were applied as a sprench on a 14 day interval starting on 14 May and ending on 25 June. The fungicides were Palladium (a mixture of fludioxinil and cyprodanil at 2, 4 or 6 oz/100 gal), Medallion (fludioxinil at 2 oz), Heritage (azoxystrobin at 2 oz—14-day interval) and Heritage (4 oz—28-day interval), and Insignia (4 or 8 oz).

Plants were inoculated about 10 days after the first fungicide application and symptoms started to develop about one month after that. The table below shows the final disease rating—based on the percentage of the plant that was wilted and dead. Statistically, all fungicides gave significant and equal control of Myrothecium crown rot on these pansies. There were a few plants in many treatments that did develop slight symptoms of Myrothecium with the exception of Medallion which was 100% effective in this trial.

Refer back to the summary table for the most effective fungicides shaded in turquoise. As always, alternate!

Effect of fungicides on severity of Myrothecium crown rot on pansy.

Treatment	Rate/100 gal (interval)	Percentage of the plant with Myrothecium
Noninoculated	——-	1.2 a
Inoculated	——-	56.2 b
Palladium	2 oz (14 days)	3.3 a
Palladium	4 oz (14 days)	1.2 a
Palladium	6 oz (14 days)	2.1 a
Medallion	2 oz (14 days)	0 a
Heritage	2 oz (14 days)	5.0 a
Heritage	4 oz (28 days)	5.0 a
Insignia	4 oz (14 days)	0.8 a
Insignia	8 oz (14 days)	0.8 a

Means followed by the same letter were not statistically different using Student-Newman-Keuls Method.

Some Ornamental Hosts of *Myrothecium*

African violet	*Saintpaulia ionantha*
Aglaonema	*Aglaonema commutatum*
Basil	*Ocimum basilicum*
Begonia	*Begonia* spp.
Bird's nest fern	*Asplenium nidus*
Bougainvillea	*Bougainvillea* spp.
Bugleweed	*Ajuga reptans*
Cape jasmine	*Gardenia jasminoides*
Cape primrose	*Streptocarpus* spp.
Coneflower	*Rudbeckia* spp.
Dieffenbachia	*Dieffenbachia* sp.
Ficus	*Ficus* spp.
Florists' chrysanthemum	*Chrysanthemum x morifolium*
Ginger (variegated)	*Zingiber darceyi*
Impatiens (New Guinea)	*Impatiens* spp.
Jasmine	*Jasminium* spp.
Lantana	*Lantana camara*
Larkspur	*Delphinium* spp.
Mandevilla	*Mandevilla* spp.
Mint	*Mentha* spp.
Pansy	*Viola x wittrockiana*
Passion vine	*Passiflora* spp.
Petunia	*Petunia x hybrida*
Poinsettia	*Euphorbia pulcherrima*
Purple coneflower	*Echinacea purpurea*
Snapdragon	*Antirrhinum majus*
Spathiphyllum	*Spathiphyllum* spp.
Staghorn fern	*Platycerium* spp.
Stock	*Matthiola incanae*
Syngonium	*Syngonium podophyllum*
Tailflower	*Anthurium* spp.
Transvaal daisy	*Gerbera* spp.
Verbena	*Verbena x hybrida*

Dieffenbachia

New Guinea Impatiens

Syngonium

=

=