

Some Like it Hot!

A. R. Chase
Chase Research Gardens, Inc.
8031 Mt. Aukum Rd., Suite F
Mt. Aukum, CA 95656-0529
www.chaseresearchgardens.com

What do *Erwinia*, *Cylindrocladium*, *Phytophthora* and *Rhizoctonia* have in common? They are heat-loving pathogens causing their most serious plant losses during the summer months. Some are so finicky that I rarely try to do tests with them outside of the summer months. This month I am reviewing some of the diseases that are hot weather problems. There are many others that can occur during hot weather so keep your eyes open.

Erwinia Soft Rot

Soft rot diseases are caused by *Erwinia carotovora* and *E. chrysanthemi*. They attack many plants including most foliage plants, un-rooted cuttings like poinsettia, achillea (Figure 1), Osteospermum and many other cutting propagated plants and calla lilies, of course. If you produce potted callas in the southern US, you might see this disease in the late winter or spring. *Erwinia* causes soft or mushy rot. The bacteria actually produce enzymes that cause the glue that holds plant cells together to disintegrate. Infected plants or plant parts can have a characteristic rotten, fishy odor. Once you smell this, it is hard to forget. I have even found that *Erwinia* makes this odor in Petri dishes without any plants being present. *Erwinia* spp. are not host specific. That means that if you have one in one crop it can spread to others.



Figure 1. *Erwinia* soft rot on *Achillea* cuttings.

The first line of defense in preventing *Erwinia* is examination of new plant materials and routine rouging of diseased plants. This is especially critical during propagation since the bacteria spread easily in water and thrive in warmth and moisture.

If you decide to use bactericides then be prepared for disappointment. The best products contain streptomycin sulfate which is not legally available in all states. The product was labeled as Agri-strep or Agri-Mycin originally and some of you may still have a supply. We have found that an 8 oz/100 gal rate is relatively effective. You should alternate streptomycin sulfate with a copper product. Copper products have been somewhat less effective against soft rot diseases but can help. Never rely on a single bactericide since development of resistance can be rapid if a single active ingredient is relied upon. Although *Bacillus subtilis* (Rhapsody) has been very good for bacterial leaf spots caused by *Pseudomonas* and *Xanthomonas*, its efficacy on *Erwinia* has not been good.

Phytophthora Diseases

Phytophthora can be present nearly year-round, especially in greenhouse crops. However, the most severe symptoms are caused in the summer months. *Phytophthora* spp. tend to attack plants at the crown resulting in rapid death. Examination of the roots can sometimes show that they are relatively unaffected and that plant death was due to stem or crown rot alone. Under cooler conditions, I see *Phytophthora* root rot which is slower to develop and looks like any other root rot – notably *Pythium* root rot.



Figure 2. *Phytophthora* crown rot on pansy.

Some of the most common plants attacked by *Phytophthora* are bedding plants (vinca, pansy and petunia), foliage plants (English ivy), potted flowering crops (poinsettia and Gerber daisy) (Figure 2) and woody ornamentals (azalea and gardenia). Traditionally the best fungicides for *Phytophthora* have been phosphonates (Aliette, Fosphite, Vital, and many others), mefenoxam (Subdue MAXX) and etridiazole (Terrazole and Truban). In more recent times, dimethomorph (Stature DM) has emerged

as an excellent treatment for Phytophthora. There are currently quite a few new active ingredients under development.

Cylindrocladium Cutting and Crown Rots

Cylindrocladium spp. cause severe losses in production of a variety of important ornamentals from the tropical (*Spathiphyllum* and Kentia palm) to the temperate (rose, myrtle and azalea). Many important diseases have been reported from the Southeast US, Hawaii, Australia and Mauritius indicating that *Cylindrocladium* spp. may be more common in the warmer climates found in these places. A review of the literature does show many *Cylindrocladium* seedlings rots on trees from temperate and tropical regions.

Cylindrocladium spp. are good saprophytes and live for long periods (often years) in the soil on organic matter. They form little survival structures called microsclerotia that withstand many extremes in the environment and simply rest until they come into contact with another susceptible plant. Control strategies must take into account the long-term soil survival of *Cylindrocladium*. It is important to use new flats, pots and potting media in propagation. If you must reuse flats, be sure to wash thoroughly (remove all organic matter) and clean in a disinfectant like bleach (or chlorine dioxide) or a quaternary ammonium.

The best fungicides for *Cylindrocladium* diseases have been fludioxinil (Medallion), triflumizole (Terraguard) and strobilurins like Heritage, Insignia and Compass O. For treatment of cutting rot it appears to be effective to spray stock plants the day before taking cuttings. This allows good prevention of *Cylindrocladium* without causing any rooting delays. Both Medallion and Terraguard have been shown to delay rooting on some woody crops. Despite this, the best quality cuttings are often produced with a single Medallion treatment. Use rates must be determined from product labels but our trials indicate a sprinch or 4 oz/100 gal with Medallion, Heritage or Terraguard yield the best results.

Rhizoctonia Diseases

Rhizoctonia spp. cause root, stem and foliar diseases of many of our most important container produced ornamentals. *Rhizoctonia* spp. usually attack plants at the soil line, causing root loss and constriction of the stem which results in girdling and death of the tops. The pathogen commonly causes damping-off of bedding plants (Figure 3), stem rot of cutting propagated plants (like poinsettia and hydrangea) and aerial blights of woody shrubs and foliage plants (especially ferns). In the southern US, *Rhizoctonia* can attack leaves when plants are grown close together and kept moist, decimating entire stock beds or flats in a few days when conditions are hot and wet. In other areas of the country, the nurseryman creates ideal conditions for *Rhizoctonia* diseases by growing plants in covered structures which are heated and irrigated overhead. Severe disease development can occur in less than a week so plants should be scouted and monitored for symptoms at once a week. Brown, irregularly shaped spots form anywhere on foliage or stems. When humidities are high the web-like brown mycelium of the pathogen covers infected portions of the plant. This can be seen many times in aerial blight and sometimes when flats of seedling crops are attacked.



Figure 3. Rhizoctonia damping-off on *Gomphrena* seedlings.

Rhizoctonia stem rot is typified by brown cankers forming at the soil line. The cankers are sunken and dry appearing and can cause the plant tops to collapse. Root rot may occur in some cases of stem rot, but not always. Root rot caused by *Rhizoctonia* appears much like root rots caused by other fungi with roots becoming brown, somewhat mushy and finally disintegrating. An accurate laboratory diagnosis is therefore crucial since fungicides that control *Pythium* do not control *Rhizoctonia* and visa versa. You must also keep in mind that mixed infections, cases where two pathogens are active, are also common. Only an accurate diagnosis will allow you to choose the best and most complete control strategies. Be sure to watch plants for above ground signs of root rot: yellow or pale green leaves, small leaves, wilting and stunting.

Our fungicide trials over the past 15 years or so have identified fludioxinil (Medallion) as the best product for *Rhizoctonia* diseases. Medallion rates as low as 0.5 to 1 oz/100 gal are very effective. Since I left Florida, 13 years ago, I have not worked on aerial blights so other products may be as good or better for these diseases. Our trials also show excellent results with thiophanate methyl (3336, Fungo and OHP6672), iprodione (Chipco 26019) and azoxystrobin (Heritage). PCNB (Terraclor) has also been used very successfully for *Rhizoctonia* and is probably the best product for controlling losses in the ground for bulb crops due to season long activity.

Conclusions

Summer diseases develop very fast and are often hard to diagnose through symptoms alone. *Phytophthora*, *Rhizoctonia* and *Cylindrocladium* look a lot alike. Get an accurate diagnosis before deciding on your control strategy. Remember that no fungicides work equally well on all diseases and mixed infections are common on some crops.