The Propagation of Plant Diseases©

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INTRODUCTION

Almost all commercial ornamental production utilizes vegetative propagation to increase plant numbers. As such, the risk of inadvertently propagating disease-infected plants is on the rise. If a plant is infected with a root or crown rot disease, it usually dies or shows symptoms that prevent its propagation via cuttings or division. However, many foliar diseases do not kill the plant and can be present within symptomless leaf or stem tissues. There are several diseases that have become increasingly common on ornamental plants primarily due to either the lack of recognition of disease symptoms or the lack of symptoms at the time of plant propagation. In addition, with the increased use of off-shore production of herbaceous and woody plants, there is an increased risk of introducing new diseases into ornamental nurseries in the U.S.A.

DAYLILY RUST

Daylily rust on *Hemerocallis* is a classic example of how to propagate a disease. Daylily rust was first identified on infected plants in the U.S.A. in late Summer 2000. By Summer 2001, it had spread to 26 U.S.A. states, the U.K., and Australia. The disease is now endemic in the southeastern U.S.A. and has changed how daylilies are produced forever. The pest-free status of this popular perennial is gone. The disease is identified by the yellow spots or streaks produced on the upper leaf surface. Directly beneath these spots, the rust fungus, *Puccinia hemerocallidis*, produces bright orange spore pustules that rupture through the leaf epidermis. The disease will eventually be controlled through the use of resistant cultivars, but until then sanitation and regular use of fungicides will have to be used. Often infected plants may remain symptomless during the summer months as high temperatures reduce rust sporulation. As temperatures cool in the early fall, rust infection becomes very evident as spores are seen on the leaves and are spread to adjacent plants. Symptoms can develop within 7 to 14 days following inoculation. Removal of rust-infected leaves can reduce disease spread. Usually daylily rust does not survive freezing temperatures, but it could survive within nurseries on winter-protected plants (i.e., inside cold-frames, covered houses, or greenhouses). It is often reintroduced into nurseries via infected plants produced off-shore or in the Southern U.S.A. (USDA Hardiness Zones 8–10). Fungicides containing triadimefon, azoxystrobin, chlorothalonil, flutolanil, trifloxystrobin, propiconazole, or mancozeb can protect plants from infection.

Other leaf rust diseases occur on *Canna*, *Iris*, *Heuchera*, *Solidago*, *Aster*, *Campanula*, *Pennisetum*, and many more. Most leaf rust diseases are spread from naturally infected nearby plants or from alternate hosts.

DOWNY MILDEWS

Downy mildew diseases are very interesting and difficult to control. The fungal-like organisms that cause downy mildew diseases are very host specific. Therefore,

the downy mildew on rose will not infect any plant other than rose and possibly closely related species. Downy mildew is often seen on woody plants such as rose and viburnum. It also affects numerous herbaceous perennials including *Coreopsis*, *Rudbeckia*, *Veronica*, *Aster*, *Centaurea*, *Lamium*, as well as annual bedding plants including snapdragon and pansy. Within the past few years, it was identified for the first time on *Solenostemon* (syn. *Coleus*), *Impatiens*, *Salvia*, and *Argyranthemum*.

Downy mildew infection can cause both local and systemic symptoms. Local infection results in yellowish to purple leaf lesions associated with white to grayish, "fuzzy" sporulation directly opposite the lesion on the underside of infected leaves. Systemic infection results when the downy mildew pathogen invades the vascular system and causes stunting, leaf and stem distortion, and overall foliage discoloration symptoms. Downy mildew infection and disease development is favored by moist, humid, and cooler temperature conditions.

Control can be difficult. Infected plants should be discarded because of the systemic nature of the disease. Removal of the symptomatic stems or shoots will not remove the disease from the plant, and it can be spread via symptomless cuttings from infected plants. Avoid irrigating susceptible plants in the early morning hours as the downy mildew pathogens produce copious spores in the early morning, predawn hours that are easily water-splashed to adjacent plants. Fungicides such as foselyt-Al, azoxystrobin, mancozeb, dimethomorph, and phosphites (or phosphanates) can provide good control when applied preventively. Fungicide resistance can develop with downy mildews; therefore, rotating chemical classes is essential. Mefenoxam can be used as a soil drench for downy mildew control, but only once since resistance is a problem.

ASTER YELLOWS

Aster yellows is caused by bacteria-like organisms, called phytoplasmas. Infection is often sporadic because it is spread primarily by aster leafhoppers feeding on infected plants and transmitting it into new plants. Most infections occur as the leafhoppers migrate north from Mexico and the Southern U.S.A. However, it also can be transmitted via grafting and propagation of infected plants. The disease is often seen on *Echinacea*, *Veronica*, *Aster*, *Coreopsis*, *Dahlia*, *Dianthus*, *Gaillardia*, *Phlox*, *Rudbeckia*, *Salvia*, *Tagetes*, and *Catharanthus* (vinca).

Symptoms are striking. The phytoplasma grows in the phloem of infected plants, disrupting plant hormone flow and causing growth distortions. Plant yellowing, bronzing, stunting, witches brooms (abnormal proliferations of shoots), flower sterility, and flower greening (phyllody) are common symptoms. Dramatic symptoms often seen on coneflower (*Echinacea*) are tiny, distorted, lime green petals and short stems developing in the center of flowers. There is no control other than removal and discarding of infected plants. Keeping leafhopper populations low can reduce spread, as can avoiding propagating or dividing infected plants.

HOSTA VIRUS X

Hosta Virus X has become a major problem for hosta growers worldwide within the past few years. This is primarily because the symptoms are now recognized as a virus disease. The disease is prevalent wherever *Hosta* is grown. Plants are often symptomless, with symptoms developing weeks, months, or even years later. Large numbers of infected hostas are currently being sold in nurseries and are

growing in gardens across the country. Symptoms can vary with hosta cultivar, making it more difficult to recognize virus infection; it often resembles natural leaf variegation. A definitive diagnosis requires laboratory testing. The most diagnostic symptom is an irregular color feathering along the leaf veins. The cultivars Gold Standard, Striptease, and Sum and Substance are commonly infected. Some cultivars have even been described based upon virus infection, such as Breakdance, much like color-break virus infected tulips and variegated *Abutilon*.

The virus is primarily spread by propagating (dividing) infected plants. Contacting a healthy plant with the sap from an infected plant also spreads the virus. Simple acts of dividing hostas, scape removal, and removing leaves can potentially spread the virus. Plants are not killed by the virus. Control depends upon exclusion and sanitation. Infected plants need to be removed and destroyed. Adjacent plants should also be destroyed since the virus-infected plants can remain symptomless for long periods of time. Some hosta cultivars are resistant or immune to infection, including Blue Angel, Color Glory, Frances Williams, Bressingham Blue, Frosted Jade, Love Pat, Great Expectations, Sagae, and *H. sieboldiana* var. *elegans*.

Canna yellow mottle virus is another problematic virus that affects *Canna* cultivars. Symptoms are often mistaken for natural leaf variegation and include a yellow or necrotic mosaic pattern on leaves or color streaking or bleeding along leaf veins. Control the virus by removing and discarding infected plants.

FOLIAR NEMATODES

Numerous herbaceous and woody ornamental plants are susceptible to foliar nematode (*Aphelenchoides fragariae* and *A. ritzemabosi*) infestation. Often symptoms of foliar nematode infestation are misdiagnosed as bacterial leaf spot diseases, downy mildew infection, or nutritional disorders. Commonly infected plants include *Abelia*, *Hosta*, *Anemone*, *Begonia*, *Heuchera*, *Rudbeckia*, *Hypericum*, *Phlox*, *Salvia*, *Paeonia*, *Helleborus*, and many others. The foliar nematode is a microscopic roundworm that lives most of its life inside infested leaves. As it feeds it kills cells, causing necrosis of infested leaves. Developing lesions may be yellow, tan, brown, reddish-purple, or black. The lesion shape is determined by leaf vein pattern. Leaves with angular or netted veins develop angular lesions. Those with parallel veins, such as *Hosta*, develop a stripe-like lesion. The main distinguishing feature that differentiates foliar nematode infestation from other leaf spot diseases is that the lesions will show a color gradient from lightly to darkly colored areas as the nematode population and feeding increases within the affected area. The nematodes cannot penetrate through major leaf veins and therefore must exit the leaf through stomata in a film of water, "swim" across the leaf vein, and re-enter the leaf through another stomata. As the nematodes move across the leaf they can be water-splashed to adjacent leaves and plants. Affected leaves will eventually die and drop from the plant. However, the nematode can still survive in the desiccated leaf for long periods of time, even years.

Since most of the nematode's life cycle is spent within infested plant tissues, it can be easily spread via vegetative propagation. However, this also aids in its control. Removal and discarding of infested leaves and stems will eventually reduce foliar nematode populations. Removal of fallen leaf debris and good sanitation also will reduce nematode survival. There are few chemical control options available for nematode control. The miticide chlorfenapyr is labeled for foliar nematode control.

However, it should not be relied on exclusively for effective control since some efficacy trials have not shown it to be very effective in reducing foliar nematode populations within infested plants.

CONCLUSION

If you propagate from disease-infected plants, you will end up with a diseased crop. This new crop will cost more money in labor and chemical costs, as well as result in a greater number of unmarketable culls. If you are uncertain about symptoms you are seeing on your crop, get help with the diagnosis of the problem from university, state, or private disease diagnostic laboratories. A proper and quick diagnosis will save you money in the long run.

Please note: *All fungicide chemical names used in this article are provided for reference and do not constitute a recommendation of one product over another. Please consult local extension specialists, crop advisors, or consultants for current recommendations in your area. Always follow label directions for rate and use guidelines when using any pesticide product.*