

If You've Seen It Once...A Dangerous Metaphor for Accurate Diagnosis

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We all know that first appearances can be deceiving and often incorrect. What may look like a great short cut on the map may turn out to be a time-consuming delay on the ground. We are all pressed for time but when it comes to diagnosing problems on your floriculture crops the cost of taking short cuts, like ignoring a problem or misdiagnosing it, can be very high.

Plants respond to problems in a variety of ways but the range of symptoms they express are limited. Leaf yellowing may indicate nutrient deficiency or it may just as likely be caused by a root rot or virus infection. Papery-brown leaf spots are often the result of fungal infections but spray burns can produce similar results.

For many problems the only way to be sure is to send samples to a diagnostic lab for analysis.

Consider the problem a grower faced with these begonias (Figure 1). The plants had symptoms somewhat similar to those previously diagnosed as *Xanthomonas* blight. But something didn't look quite right. The leaves also had yellow discolorations and sunken areas were observed on the stem.

The grower initially assumed his crop had a bacterial blight but decided to get a second opinion by sending samples to a diagnostic lab. In the lab, when examined microscopically, some of the leaf lesions showed typical "ooze" (Figure 2) produced by bacterial pathogens, but other lesions did not, suggesting the presence of two different problems. Suspecting that these symptoms might be caused by other factors such as phytotoxicity or a virus, the diagnostician further questioned the grower regarding the possibility of chemical injury. Records showed no sprays prior to the appearance of symptoms.

Having ruled out phytotoxicity as a cause of the lesions without bacteria, and knowing that Impatiens Necrotic Spot Virus (INSV) causes a range of symptoms that are often mistaken for other problems, the diagnostician then used a serological Immunostrip® to test for INSV in the tissue that did not "ooze". The test results were positive (Figure 3), confirming the presence of INSV, one of the most common and troublesome diseases found on greenhouse crops. The diagnosis of two different diseases (bacterial and viral) on these begonias was completed in less than a day using a carefully considered stepwise process of elimination to rule out factors that cause look-alike symptoms. Armed with a documented answer the grower was able to effectively work at cleaning up the problem by disposing of infected plants, avoiding overhead irrigation



Figure 1.

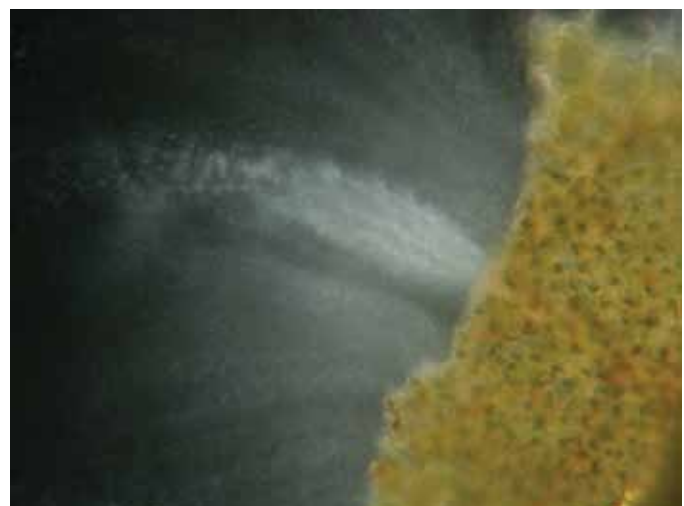


Figure 2.

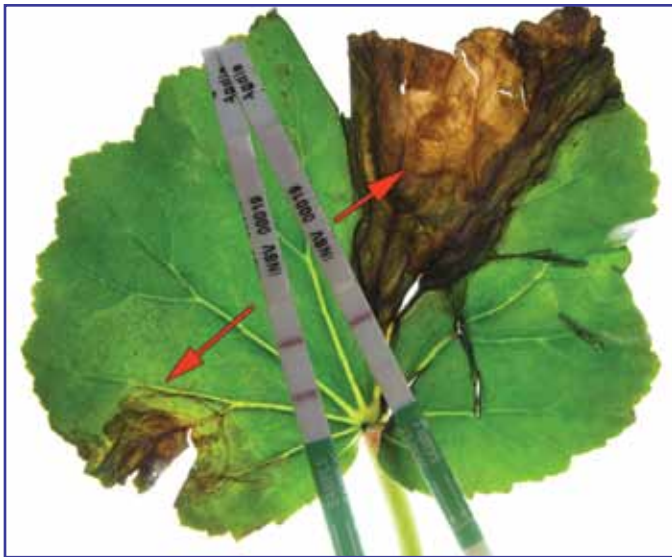


Figure 3.

that would spread the bacteria and, most importantly, controlling the thrips that spread the virus.

Another sample of *Hiemalis begonias* also presented a case of erroneously “jumping to conclusions.” After ruling out disease, checking media pH and EC, and discussing possible causes with the grower, the plants in Figure 4 had been diagnosed with excessive light exposure and heat stress. When the grower later found similar symptoms (Figure 5) in hanging baskets growing close to the greenhouse roof in a different range it was assumed the symptoms were again due to heat stress and sunscald. However, when symptoms continued to appear on new foliage even after cloudy weather and shade was added to the greenhouse, the grower became concerned and contacted the diagnostic lab. Upon closer observation ring-like and mosaic patterns were noted on foliage and the symptomatic tissue tested positive for INSV. Lesson learned: never assume the problem you had last year is the same one you have this year: always make sure by testing and confirming.



Figure 4.



Figure 5.

Digging Deeper

Other plants such as poinsettia have their own set of copycat symptoms. The two poinsettia plants shown in Figures 6 and 7 on page 20 both appear to be wilting. Is the plant in Figure 7 simply a more advanced stage of what is shown in Figure 6? The only way to correctly diagnose the problem is to dig deeper. Since each client submitted the entire plant to the clinic for examination we were able to get to the cause of the problem. Had they only sent the wilting branches, diagnosis would have been impossible. The plant in Figure 6 had healthy white roots and quick measurement of the media pH and EC showed they were within normal range for poinsettia at this stage of development. Close examination of the base of the wilted stem showed the branch had mechanical injury (most likely from hand watering or from spacing) but the main stem was not affected. Once the damaged branch senesced on its own, the plant was fine. However, the plant in Figure 7 was found to have extensive root decay. An initial visual exam did not reveal the cause, but the lab confirmed the presence of *Pythium* in the roots by placing some of the infected roots on a selective growth medium that permits growth of the fungus while preventing growth of most other fungi. *Rhizoctonia*, the other common cause of root/stem decay in poinsettia, was not recovered. The grower was able to minimize spread in the crop by discarding badly infected plants, sanitizing the greenhouse area, and treating the remainder of the crop with fungicide drenches to keep the problem in check.

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Figure 6.



Figure 7.

The foliar symptoms observed in these two flats of petunia (Figures 8 and 9) suggest a possible nutritional or pH imbalance. However, here is yet another case of potential misdiagnosis when these flats are judged only by their “cover.” Figure 8 is actually infected with black root rot, a disease caused by the fungus *Thielaviopsis basicola*. The discoloration of foliage on plants in this tray is due to the fungus attacking the roots and crowns of the young plants (Figures 10 and 11).



Figure 8.



Figure 9.

The symptoms shown in Figure 9 took more detective work. The greenhouse manager initially thought the discoloration was due to low nitrogen, but as symptoms continued to develop quickly, the plants became bleached so samples were submitted to the diagnostic lab. The pH and EC levels of the media in affected plants were normal, indicating a nutrient problem was unlikely. The roots appeared healthy and no bacterial or fungal pathogens turned up in a microscopic exam of the plants. On the clinic form the problem was listed as widespread, affecting about 65 percent of the petunias in one house. It was also noted that the problem showed up quickly. A question from the diagnostician about recent pesticide use prompted a review of spray records and discussion of the problem with the applicator.

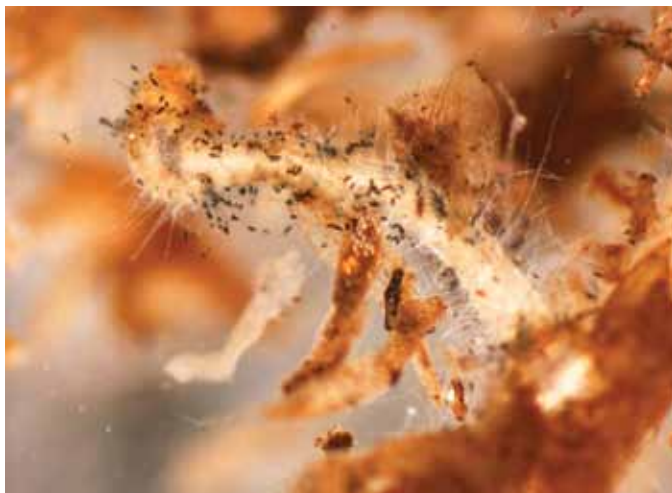


Figure 10.



Figure 11.

Records showed that one of the growers had used a fungicide a few days before the symptoms appeared. The correct amount of product was weighed out but a sprayer malfunction caused the plants to get an excessive dose, leading to the symptoms.

What Can You Do On Your Own?

Growers can prevent many problems by being vigilant in the greenhouse. Routinely monitor your nutrient stock tanks, water and media pH and EC levels, and make timely adjustments. Sticky cards and scouting for insect, mite, disease, and physiological problems can help prevent disasters by early detection. Examine plants frequently for signs of problems and send samples promptly to your diagnostic lab if the cause is in doubt.

Most states have one or more diagnostic facilities, which provide a range of services to growers. You can check the location of your nearest facility using the lists available for download at: http://apsnet.org/directories/univ_diagnosticians.asp. Tests available at different labs vary somewhat so you may want to call for confirmation before sending samples.

When submitting samples to the lab for diagnosis please fill out the clinic form as completely as possible. It's better to over communicate than be reticent about mentioning something that may have a bearing on the diagnosis.

1. Submit adequate plant material (several whole plants and flats are preferred in most cases when working with floriculture crops).

2. Provide plant and variety/cultivar name and approximate age of the plant or crop.
3. List the symptoms of concern, when they were first noticed, severity, and distribution. The amount of spread is a very important piece of information. Knowing that 85 percent of the plants are affected in a single area of the greenhouse may point toward a non-disease cause, while seeing 20 percent of the plants affected but scattered throughout the greenhouse might indicate a disease or insect problem.
4. Give extensive cultural/chemical background information. The diagnosticians won't know that you've drenched your mums with a fungicide three days before you collected the samples if you don't tell them. Knowing that a recent fungicide application has been made will enable them to adjust how they work with the plant sample. For example, *Pythium* often will not grow out on isolation media, even when present, if the plants were recently drenched.
5. Provide enough media for pH and EC testing. An imbalance in salt and pH levels can contribute to root disease problems so this additional information is important to the diagnostician.
6. Package correctly. Whole plant samples should be left in the pot or flat if practical. Media should be moist but not wet. Place the pot in a plastic bag and secure it to the base of the main plant stem to contain the media around the roots. Soil on foliage can lead to foliar symptoms that were not there when you shipped the sample. To prevent excessive drying, wrap the top of the plant in dry newspaper and bring the plastic bag up loosely to seal at the top. Package the plant in a sturdy crush-proof box with padding to prevent shifting and ship using an express delivery service. Figure 12 shows what can happen when plants are not held securely in place.



Figure 12.

Avoid weekend shipments where prolonged time in transit may allow the sample to decay before it arrives at the lab.

Even the best possible sample with complete information will not allow for an accurate diagnosis unless it arrives in good shape. More information on packaging greenhouse samples can be found at: <http://www.ppd.purdue.edu/PPDL/physical.html#greenhouse>.

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Marketing Sustainable Bedding Plants

by Jennifer H. Dennis

Imagine a marketing campaign that allows your business to increase profits and consumer interest while contributing to saving the environment. You could easily enter the world of marketing sustainability by developing point-of-purchase materials that promote environmentally friendly, energy efficient, organic, or pesticide-free petunias, marigolds, and vinca to name a few. If you think this simple strategy will increase sales and make consumers pay more for the added benefit of saving the environment, hold off on rejoicing.

Have you examined whether sustainability makes sense and fits well with your existing marketing strategy? Is this program on task with your mission and vision? Do your customers value this new effort? Do your customers know the difference? Here are some items to consider before deciding whether sustainability should be a major push for your business.

Does Sustainable Make Sense With Your Overall Strategy?

Businesses often adopt new product lines and causes without examining whether they are consistent with the company's image. In this case, sustainable causes fit into most existing models and help to fight negative and incorrect press about the horticulture industry contributing to greenhouse gasses. However, it is a good idea to examine the strengths and weaknesses of your business and identify how adding sustainable products will enhance those strengths or perhaps even expose weaknesses. For example, if your garden center is



perceived as a knowledgeable source of high-quality plant and gardening products, will carrying a new product line increase the human cost of understanding how to use these products? Will customer perception change if staff knows little about this new product line? Understanding the benefit of adding any new products and services is essential.

What Do You Consider Sustainable?

Most garden centers know that color sells. So before marketing efforts, sustainable or otherwise, can pay off, plants have to be of the same quality you normally sell. If your bedding plants meet this requirement, then the next step is to understand the consumer's perception of sustainability and how this may enhance or inhibit sales. Have you ever gone somewhere with a friend and asked them how they enjoyed the event? They replied it was nice, but your thoughts were exactly the opposite. You were probably thinking, "Were we in the same place?" Measuring this kind of experience is often a big problem with determining the success of events or marketing efforts.

Different people have different standards and expectations that affect their perception of an experience. This same concept applies to using the term "sustainability" to market bedding plants. Consumers may not relate to the term sustainability, or they may have a different meaning than your definition.

Based on a survey conducted at Purdue University on consumer knowledge of the term sustainability, only 5 percent (n=69) of consumers knew what this term meant. Among their