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Digital Photography for Horticulture Professionals

Part 3

Digital Image Applications For Crop Diagnostics



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Digital Photography for Horticulture Professionals

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Part 3: Digital Image Applications for Crop Diagnostics

Digital photography can be readily applied in crop diagnostics. Most crop problems can be minimized or avoided, and overall costs dramatically reduced, if the evaluation and management of these problems is expedited. This involves an integrated approach. First, growers must be able to rapidly diagnose and treat common problems before seeking professional help; second, growers must create a systematic, detailed history to provide crucial information about past crop production deficiencies that are otherwise difficult or impossible to pinpoint. This is where digital images can help.

In documenting crop damages for example, growers may need to take a series of pictures to better illustrate the specific problem and provide sufficient information for diagnosis. Additionally, the higher the quality of the pictures, the higher the chances of accurate and rapid diagnosis of the problem. Proper contrast and color are essential in diagnosing some nutritional imbalances, for example.

For optimal results in obtaining the best digital photographs, here are some simple rules to follow.

Reference Point

In this situation, impatiens plugs have been kept for too long in the plug tray (Figure 1). To show height differences, place another plug tray to serve as reference point. Try to use some type of reference when illustrating growth differences among crops, cultivars, etc.

Foliage Color

When photographing foliage or flower discolorations, e.g., those resulting from nutrient imbalances, disease, etc., make sure you achieve sufficient contrast in the image. Chlorosis in lower foliage of celosia in Figure 2 is accentuated by the green of other foliage.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

Similarly, a necrotic lesion in the New Guinea impatiens in Figure 3 stands out in contrast with the healthy upper foliage.

The image in Figure 4 is too dark.

Some leaf surfaces are highly reflective because of their waxy cuticle. Consider increasing the EV setting. There is too much glare on the fern pinnae in Figure 5. Consider moving the plant in a shadow or placing a screen in front of the bright light.

Full Complement of Photographs

A full complement of photographs represents the “entire picture.” The series of digital images on page 5 is an example of the type of photographs you need for crop diagnostics. The problem occurred on Boston ferns grown in the early fall months. The symptom was foliar necrosis affecting the tips of the frond pinnae.

After visiting the operation and discussing cultural practices with the grower, we took a series of photographs, which were very helpful in diagnosing the problem.

Close-ups of the foliar necrosis and the damage to young developing fronds were the first pictures (Figures 6 and 7).

Second was the root system (Figure 8). Clearly, there was damage to the root systems as well, evidenced by the brown coloration and lack of healthy feeder roots.

Following the symptoms on the crop, we took a picture of the greenhouse where the Boston ferns were grown (Figure 9). This helped us visualize and document the growing conditions, for example, that the crop was grown on a covered floor with pot-to-pot spacing, and it was irrigated overhead. In addition, from that photograph, we were able to make inferences about the light levels in the greenhouse.

The symptoms were indicative of over-fertilization, and when tests were performed, excess fertilizer was found in the growing medium. In searching for more “clues,” we found a white crust around the rim of some pots, also indicative of excessive fertilizer applied to the crop (Figure 10).



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10



Figure 11



Figure 12



Figure 13

Healthy roots are white (white arrow) while diseased roots are brown (red arrows)



Figure 14



Figure 15

Photograph Healthy and Damaged Plant Tissues

In the example in Figure 11, a poinsettia crop was exhibiting poor growth with some wilting. A grower sent us a picture of the root system, both overall and a close-up. Although healthy white roots are present, the extent of root system development is not satisfactory for the stage of the crop. Further examination of the root system (Figures 12 and 13) reveals more severe root death (brown roots). The cause of the problem was identified as *Pythium* root rot.

Photograph Underside of Leaves

Some disorders are expressed on the undersides of the foliage. For example, oedema in geraniums is a physiological disorder (Figure 14), which is manifested by hardened tissue appearing as corky, tan blisters on the foliage. The symptoms are commonly found on the undersides of leaves.

Insect and pests, as well as some disease symptoms, also are found on the leaves' undersides. For example, whitefly larva is found on the undersides of leaves in Figure 15.

Detect Any Pattern of Damage

If multiple plants show symptoms of damage/problem, take a photograph of the bed/area. This will give an indication of the spread of the damage and any possible patterns across the crop. In the example in Figure 16, chlorotic plants and leaves were seen throughout the bed of vinca. The symptoms and their pattern suggested a root disease. However, on closer inspection and when several young plants were extracted from the rooting medium, it was evident that the problem was caused by improper planting technique (Figure 17).

The characteristic "J" hook (Figure 18) occurs during planting when a person pushes the root system of the plug into the medium with his or her thumb, thus applying too much pressure on the fragile root system. Often the epidermis on the side of the stem is damaged by the thumb's fingernail. The damaged root system rarely recovers to adequately support growth of the young plant. Hence, plants suffer from lack of nutrition and water and lag behind the rest of the crop.

The grower can go back and look in the planting records to find out the employee who planted the crop and correct his/her planting technique.

Use a Macro Lens for Close-up Pictures

When photographing symptoms on plants with small-sized foliage, or when you want to take close-ups, use a macro lens or a respective macro setting on your digital camera that allows you to take a photograph of the symptoms that fills the entire field of view.

Summary

In summary, digital photography can be very helpful in crop diagnostics. Growers need to be thoroughly familiar with their cameras, i.e., how to change various settings, and follow basic rules of photography. They also need to follow some rules in order to obtain the best results and ensure accurate and rapid diagnosis. This is essential when pictures are sent to a county agent, extension specialists, or outside consultants.



Figure 16



Figure 18



Figure 19. Close-up of powdery mildew on foliage of Salvia.



Figure 17

Figure 20. Necrotic brown lesions on *Plectranthus* caused by heat stress.



Notice that in both Figure 19 and Figure 20 the foliage is in sharp focus while the background is not. This is called *shallow depth of field* and is characteristic of photographs taken with a macro lens.

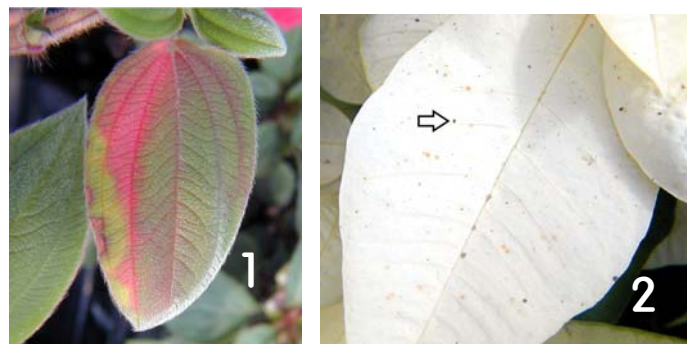


Figure 21. Using a macro lens allows you to photograph minor variations in foliage color, as in the phosphorus-deficient leaves of *Tibouchina* (1), as well as small specks, dots, etc., as in the poinsettia bract showing oedema symptoms, tan and brown specks (arrow, 2).

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