

TECH TRAINING

PLANT HEALTH DIAGNOSTICS PART III: ABIOTIC DISORDERS

Abiotic or physiological disorders are plant health issues caused by non-disease factors. Environmental conditions like temperature, light and substrate moisture are responsible for many abiotic disorders, while others are caused by chemical injury, nutrient deficiencies or genetic abnormalities. Remember that abiotic disorders aren't contagious diseases but, in many cases, an environmental factor must be changed to correct the disorder.

Tip 1: Compare Symptoms with Common Disorders

- Abiotic disorders tend to be more uniform across a crop than biotic diseases.
- Common symptoms and potential causes:
 - Chlorosis (Yellowing)—Nutrient deficiencies, chemical phytotoxicity.
 - Necrosis (Browning)—Nutrient toxicities, heat or cold damage, herbicide drift, chemical phytotoxicity, sunscald.
 - Distortion—Calcium (Ca) or boron (B) deficiencies, herbicide drift, chemical phytotoxicity, flue gas leaks.
 - Other abnormalities—intumescence, oedema, chimeras, reversion.



Spray phytotoxicity symptoms of necrotic spotting from a chemical misapplication.

Tip 2: Investigate Recent Environmental Conditions

- Were there temperature extremes or environmental control system failures?
 - Are symptoms located in low spots, near vents or heaters?
- Did plants dry down excessively?
 - Have plants been allowed to go through normal wet-dry cycles?
- Is relative humidity within the intended setpoints for the particular crop?



Intumescence occurring on ipomoea leaves.

Tip 3: Check Recent Application Records

- Were any pesticides applied recently?
 - Were all label instructions followed correctly?
 - Was the correct rate applied?
- Were any herbicides applied around the greenhouse?
 - This includes nearby farms or utility rights-of-way.
- Have sprayers and injectors been inspected and calibrated?
- Was application equipment cleaned properly after the last chemical application?



Leaf distortion from flue gas exposure in the greenhouse.

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Abiotic Disorders. Many abiotic disorders observed in the greenhouse are direct injuries caused by herbicide exposure, pesticide misapplication or environmental extremes. In other cases, abiotic disorders may have a greater effect on aesthetic value than the actual health of the plant, as is the case with genetic reversions, chimeras, intumescence or oedema and guttation. Nutrient deficiencies and toxicities are also abiotic disorders but are often discussed on their own due to the wide range of symptoms observed. For more information on nutrient disorders, check out [Plant Health Diagnostics Part II](#) or the [General Nutrient Disorder Diagnostic Key](#).

Environmental Injuries. Direct damage from temperature extremes can occur when environmental control systems malfunction. For instance, excess heat can quickly build up in the greenhouse if vents fail to open. Both [heat](#) and [chilling injury](#) can cause wilting, leaf abscission, desiccation and necrosis. Frequent or extreme dry-down events can cause irreversible damage and impair root function. It's also important to consider that environmental stress can make plants more susceptible to disease.

Chemical Damage. [Phytotoxicity](#) from pesticide misapplications or herbicide drift can lead to many symptoms including necrotic spotting, bleaching, discoloration, distortion, leaf drop and flower bud abortion. Whether intentionally applied off-label or unintentionally applied at the wrong rate or time, chemical applications can cause damage to appear rapidly—which is often irreversible. In many cases, growers will have to wait for new growth to cover the symptomatic tissue.

Abnormalities & Chimeras. A plant that is supposed to be variegated but has solid-colored leaves may be a sign of reversion, where the variety is reverting to its original form. In contrast, a plant that is supposed to have solid-colored leaves that are instead variegated may be a sign of a [chimera](#) or a genetic mutation resulting in unique physical characteristics. Compared to other abiotic disorders, it is not unusual to only have one or a few affected plants in a crop.

Intumescence & Oedema. Conditions that lead to abnormal cell growth on the leaf epidermis are often classified as [intumescences](#) (enlarged, protruding masses of cells) or oedema (ruptured and collapsed epidermal lesions). While the exact causes of these issues are not fully understood, oedema occurs in response to root water uptake being greater than the rate of transpiration, causing cells to rupture and become corky. Ensuring substrate moisture and relative humidity are not too high for extended periods, especially on cloudy days, can help prevent these issues.

Flue Gas Leaks. Heating is a crucial component of greenhouse production during winter, especially in northern climates. Heating units can sometimes malfunction, causing exhaust, also called flue gas, to seep into the greenhouse. Many components of flue gas can cause damage to plants, but one of the most common symptoms is epinasty, or the downward bending and distortion of leaves in response to ethylene gas. Regular [heater maintenance](#) and repairs can help reduce the likelihood of this issue. Sensitive species like tomatoes can be used as an indicator plant to determine if there is a gas leak.

For more information, check out these additional resources:

GrowerTalks' PestTalks E-News: [More on Phytotoxicity](#).

e-GRO Alert: [Recognizing and Preventing Phytotoxicity](#).