

Natter's Notes: Heat Stress

Jean R. Natter (September 2017; Metro Master Gardener Newsletter)

This has been an interesting year as far as plant problems go. The past winter was colder than usual; this spring was wetter than usual; this summer hotter and drier than usual; and, oh yes, we had a total solar eclipse (2017-08-21) even as I was writing this. Then, too, in spite of the plentiful rainfall this past winter and spring, established trees in forests and landscapes are dying from consecutive years of drought.

For the most part, causal agents of plant problems are abiotic, caused by naturally-occurring adverse environmental factors, also the garden's care-takers, John and/or Jane Doe. So, when clients ask which disease afflicts their plants, we have a lot to consider. We need a detailed history of what occurred and when, including pre-plant preparations as well as follow-up maintenance.

Just how plants react to high temperatures depends upon numerous factors, among them the extent and duration of the heat; the relative humidity; wind conditions; soil moisture content; the kind of plant, its age, site, and general status before the heat hit. (Phew! That's a lot to consider.) Sometimes leaves are only damaged superficially. Other times, tissues die.

Tissue survival is most likely when the plant is fully hydrated well before the heat hits. If heat is predicted, water the night before or early morning, between 2 and 6 AM.

One good thing about the recent heat waves, the accompanying low humidity has helped limit common leaf diseases. Well, except for powdery mildew, the fungus that creates a whitish film on the leaf surface. If that's the case, recall that most fungicides are preventive and must be applied at the very first sign of disease, long before the leaf is snowy white.

Accurately diagnosing heat damage relies, in part, upon how well you "read" the signs and symptoms. It's a skill that requires time to develop. (You know the old saw: Practice, practice, practice.)

Let's take a look at how heat damage may be expressed, especially on leaves, since that's often the only thing a client submits for diagnosis.

Young dogwood (*Cornus* sp.), probably about 2 years old, in a commercial landscape. (Fig 1)

Exposure to bright sunlight damaged superficial tissues, killed the chlorophyll (green), revealing the underlying anthocyanins (red pigments), resulting in a reddened sheen on only the most exposed leaves. The somewhat shaded leaves retain excellent green color.



Fig 1 – (L) Superficial heat damage to dogwood leaves (*Cornus* sp.) killed green pigments at the leaf surface, revealing underlying red pigments. (J.R. Natter; 2017-08)

Vine maple leaf with dry, brown edges, evidence of acute water shortage to the shrub. (Fig 2) Sudden heat exposure to a 19-year-old shrub damaged many leaves in a wide swath across the shrub. Affected leaves were tan and shriveled while others only had dry edges. Client wondered if the tree was at the end of its life span. The Ask an Expert response said essentially this: It's the recent heat. (Client image; 2017-08)



Fig 2 – Vine maple leaves, damaged by heat and sunlight. Owner asked if the 19-year-old tree had a disease. Another vine maple, planted at the same time, was fine. (Client image; Ask an Expert; 2017-08)

Hosta, exposed to sudden and extreme heat, accompanied by low humidity. (Fig 3) The most severely damaged tissue at the right edge of the leaf, outlined by a zone of white tissue, still retains normal color. This kind of damage can develop in susceptible plants even when they're in full shade. (J.R. Natter; 2017-06-24)

Blueberry; 2 years old; all the other blueberries were unaffected. (Fig 4) Client asked why her blueberry shrub looked so peaked. Many leaves were brown. Further, few fruit had set and weren't sizing up. She was puzzled, because she

knew that, to establish a woody shrub, "you water regularly for the first 2 years, and then just once a month." After pictures were emailed, the office MGs also realized the blueberry was

surrounded by bare soil. Key point: Blueberries require adequate water throughout their lifetime; mulch, too. (See "Growing Blueberries in Your Home Garden"

<https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec1304.pdf>)



Fig 3 (L)– Hosta leaf, damaged in less than a day. Searing heat and low humidity dried tissue so rapidly it retained its normal color. The crisp, dry zone at the periphery is separated from healthy tissue by a narrow white zone. (J.R. Natter; 2017-06)



Fig 4 (R)– Blueberry with severe, short term water shortage. Leaf tissues were permanently damaged but the plant is likely to survive. (Client image; Ask an Expert; 2017-08)

Unidentified tree in the same 2-year-old commercial landscape as the dogwood in Fig 1. (Fig 5)

The dead, brown tissue at the tip of the leaf at the right indicates chronic water stress. The light-brown leaf edges indicate a more recent, acute water shortage. Curled leaf edges indicate a current, low-grade water shortage similar to physiological leaf roll in tomato. This tree is irrigated daily by the lawn sprinklers, for an unknown number of minutes.

Rhododendron with severe heat damage to leaves and flower buds. (Fig 6) Here, my guess is that the damage occurred relatively early in the spring, perhaps with the first heat wave of the year

because the flower buds are present but frozen in time. Brown leaf areas were sunburned and are dead, whereas chlorophyll in the yellow areas died.



Fig 5 –(L) A young tree, watered only when the sprinklers irrigate the lawn. Leaves reveal chronic water stress. The edges dried, curled, and died. (J.R. Natter; 2017-08)



Fig 6 – (R) Rhododendron leaves and partially open flower buds damaged by heat during early spring. (J.R. Natter; 2017-08)

Leaves damaged by water stress and sunburn during the previous growing season. (Fig 7) These leaves were damaged the prior season. Most reveal a chronic, long-term water shortage. The bottom leaf and that in the center of the middle row were sunburned the prior year. The two leaves at right center show damage from at least two years previously. There, the light-colored areas within the brown reveal that tissues are breaking down and beginning to flake off. Sometimes such tissue falls out, creating holes.



Fig 7 – (L) Rhododendron leaves submitted in March, but were damaged by heat (sunburn) and chronic water stress (long-term shortage) the prior year. (Client image; Ask an Expert; 2016-03)



Fig 8 – (R) Tomato with very mild blossom end rot (BER). Damage is superficial, perhaps only several cells deep. (Client image; Ask an Expert; 2017-08)

Blossom end rot (BER) of tomatoes. (Fig 8) A story about heat stress isn't complete until you discuss blossom end rot. The discoloration at the blossom end on this tomato is pale and only skin deep, which is far different than the usual description of dark brown or blackened tissue which defines more severe damage. Whether the cells may, or may, be damaged further depends upon the ability of the roots to absorb sufficient water to transport calcium to the cells. (Soil calcium is often adequate.) Some varieties, particularly 'Roma' tomatoes, are more susceptible than others. Container-grown tomatoes of all kinds are at risk.