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## Diagnosing Greenhouse Leaf Margin Issues

*Leaf margin issues are common and occur across many crops that growers often just brush them off as part of the growing process. In truth, they indicate issues that can lead to bigger problems going forward, and may themselves cause huge headaches as the crop matures. We review a list of causes for you to consider.*

Damaged leaf margins, especially in bedding plants, tend to be covered up as the plants grow. This leaves dead or compromised tissue in dark, humid interior canopy conditions and is one of the first sites for Botrytis to establish. Therefore, as you go into your spring crop scouting routines, pay attention to early margin disorders and eliminate the issue. Once identified, remove damaged leaves as soon as is possible. So what are the causes of leaf margin disorder? There are many, and the end results of any one cause almost looks identical to other causes. Therefore, to diagnose these issues, one needs to review the environment and activities involving the crop to fix a diagnosis. Here we provide a review to help you discover margin problems you may come across.

### Cutting/Seedling Transplant Shock

The initial reason why the subject of diagnosing leaf margin issues came up was because a large shipment of geranium plugs had come in with many of the plugs showing marginal burn on the oldest leaf (Fig 1). This was a relatively new grower, and it didn't take long to explain that when a cutting is taken, the plant is put

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Fig. 1. Common Geranium cutting leaf margin burn on the oldest leaf.

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under some water stress, yet the leaves that are semi mature must still transpire and photosynthesis must take place for the cutting to survive. This means two things happen. First, the plant tries to canabalize (relocate) photosynthate from older leaves to build new roots and maintain new leaf development. Secondly, the stressed leaf margins tend to die as nutrient levels drop or dessicate due to low water status. Younger leaves are not yet at maximum photosynthetic activity, represent the future for the plant, and thus these leaves tend to be prioritized and not scavenged by the nutrient relocation process. On many cuttings, especially geraniums, we get a small amount of leaf margin disorder but almost always just on the oldest leaf. You can remove this damaged leaf to reduce disease potential. Seedlings can exhibit the same response, however, the effects are far more serious in terms of growth delay and overall damage to the physiology of the cutting. Proper irrigation of transplanted seedlings prevents this.

**Heat/Light Stress/Scald**

One of the more common leaf margin issues seen is sun scald (Fig 2,3). It is more common in plants



Fig 2. Over-fertilization, too high of light levels and drought caused this damage on Calathea.



Fig 3. Sun scald on Bird's Nest Fern, Asplenium nidus fern moved into a bright greenhouse.



Fig. 4. Fertilizer overdose in summer on Staghorn Fern.

housed long term such as conservatory plants, or acclimated plants acclimated for interiorscape use and then brought back into a greenhouse. Plants may have been moved, shading removed in Fall too soon, or plants used in displays near windows. Plant leaves acclimate to their microconditions, even in conservatories. Any sudden and prolonged exposure to higher light levels may cause the leaf to be overheated, damage the cells. This can, in turn, cause very rapid water loss, especially in margins. If water status is low, plants cannot keep up and the margins are the first to experience salt build up and cell failure, followed quickly by mid-leaf sections.



Fig. 5. Surfactant damage on pansy, applied at high afternoon temperatures.

It can be spotty based on the micro-environment of the leaf or sections of the leaf.

**Cold Water Damage**

The reverse can happen in many plants, especially African Violets (Fig 7.) Water pipes exposed to very low temperatures outdoors can carry water that is near freezing into the greenhouse.

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Application of this water rapidly drops the cell temperature of the leaves and can disrupt enzymatic processes. Members of the Gesneriaceae family seem to be very sensitive to cold, and their photosynthetic system is easily damaged. Another scenario is that water droplets left on the leaf after watering with cool water evaporate, and as the droplet temperature drops, the same effect occurs.

### Wind Damage

A common, but localized issue is wind damage from fans, open doors and/or heaters that blow directly into the crop (Fig 8, 12). The same scenario applies regarding water status and low humidity. As the dry air passes over the plant, the evaporation rate may exceed the capability of the plant to maintain proper water status in the leaf margin area.

Why the margins? Because the amount of surface area exposed to the air is greatest at the margins. Usually this cause is easy to pick out by looking at fan direction, and margin burn patterns.

### Temporary Wilt and Drought

Often I have been asked to look at young seedlings with the most matured leaves showing curled margins that are often tan. The cause is a temporary but extreme period of dryness. Folks



Fig. 6. Fluoride damage on Dracaena 'Janet Craig'



Fig. 7. Cold Water Damage on Cape Primrose, Streptocarpella.



Fig 8. Cyclic Dessication of Dracaena Janet Craig.

assure me they never let their cuttings dry out, but the truth is right there in front of us. It happened. A very similar effect can be seen on plants that are chronically grown too dry, or put in indoor locations, such as an interiorscape, where the environment is very dry. The leaf tips or the entire leaf margin show incremental, or perhaps better put, sequential margin cell death. On some species, such as the Dracaena 'Janet Craig' (Fig. 8), if you look close, you can see the waves of tissue death due to cyclic heating of the room. Many, many tropical monocots respond to drought and dry winds with leaf tip margin dieback.

### Pesticide Accumulation on Leaf

Many greenhouse plants are very sensitive to surfactants used in pesticides (Fig 5). The issues appear when you apply the pesticide. If you are using label rates, under cool, morning conditions, phytotoxicity is very rare. However, spray at 3:30 pm in July and your surfactants go into hyper-mode and damage leaves, but more often, the leaf margin as the surfactant/pesticide mix accumulates at the leaf's edge. Ferns are notorious for having warm application leaf margin burn as can be seen

on this 'Macho' fern leaf. (Fig 10).

### Fertilizer Salt on Leaves

Large, cupped leaves can often accumulate fertilizer solutions (Fig 13). As the soluble salts dry, it leaves a salt deposit on the leaf. Repeated applications over time and you can build up a tiny pool of caustic salts. Calathea, Strelitzia, Begonias, and Pepperomias are very common victims of salts. If one can observe both greenhouse and conservatory leaves once a month, scouting not only for insects and disease, but also for fertilizer build up, this problem can be eliminated by fresh water washing. Of course, avoiding repetitive foliar feeding protocols is the best practice.

### Nutrient Deficiencies

Poinsettia growers are no stranger to trace element deficiencies causing leaf margin disorders (Fig. 11). Marginal Leaf Burn is a calcium deficiency in the bracts. It is easily dealt with and prevented with calcium foliar sprays. In hydroponic situations, one can sometimes see marginal disorders due to potassium deficiencies. In most cases there are other symptoms to help you determine it is a nutritional deficiency, as opposed to an environmental issue.



Fig 9. Over-Fertilization of Bromeliads.

### Over-fertilization

Almost all greenhouse crops will show symptoms of over-fertilization (Fig 9). In some, the margins turn tan and curl, in others, such as bromeliads, you see a very gradual gradient from green to yellow to a dark brown. As with drought, as the leaves transpire, more water is lost at the margins, hence more nutrients are brought to that area from the xylem



Fig. 10. Pesticide Surfactant Damage on Ferns. water flow to the leaf cells. Salts don't leave when the water evaporates, hence they build up to toxic concentrations in a gradient pattern. At first sign of this issue, leaching can reduce, but not prevent the initial damage.

### Lime Overdose

I am always concerned when a grower, worried about a low pH situation in geraniums for example, decides to use liquid, or finely powdered lime to fix the problem immediately. Invariably, this leads to a rapid rise in soil EC, and a wave of high salts (Mg, Ca, etc) into the xylem flow. As these accumulate in the margins, we see marginal burn. Patience is a virtue, and plants with burned edges do not sell as well. Start with 1/2 rates to be safe.

### **PGR Overdose**

Occasionally one can have marginal burn when applying PGR spray applications. This is usually due to any surfactants present, and to applying the PGR on a bright, hot sunny afternoon.

### **Herbicide Damage**

I have seen my share of leaf curl and leaf margin damage caused by inadvertent use of a sprayer that previously had been used for herbicide application. Sometimes a well meaning staff person spraying the exterior of the greenhouse, forgets to turn off the fans. If you have sprayed herbicide in the last 10 days don't discount this as a remote possibility.

### **Natural Tip Margin Dieback.**

There are some plants, such as Raphis palms, cut-flower type irises, and monocots tend to show tip and leaf end margin die back no matter what anyone does. Proper irrigation, light and temperature minimize the tip die back.

### **Last Words:**

If you do have significant leaf margin/tip damage, endeavor to keep the now damaged leaves dry with good air flow between plants, keep relative humidity as low and whenever possible, remove them. Sanitation is everything!



Fig. 11. Bract Edge Burn on Poinsettia Leaves.



Fig. 12. Fan/Heater Air Damage to Violets.

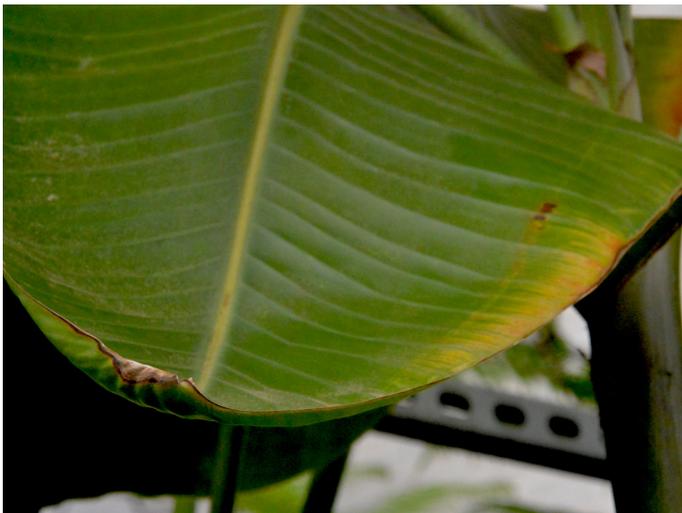


Fig. 13. Fertilizer Accumulation on Conservatory Plants.