Tip Burn and avoidance in leafy hydroponics crops, blossom end rot of tomatoes and side collapse on sweet peppers

This information concerns the condition caused by inadequate movement of calcium into the plant but does not relate to symptoms of marginal leaf burn on older leaves, often associated with low potassium, or the small circular necrotic (dead tissue) areas that are seen on the drip points of leaves caused by guttation. Guttation is unrelated to calcium and resulting from roots pumping cell sap from the plant hydrothodes, usually while the stomata are closed in cooler highly humid conditions when the nutrient cF is too low. (Guttation droplets on rose leaf- left)

Tip burn is the result of inadequate calcium reaching the outer areas of the leaves and is similar to blossom end rot on tomatoes and burn seen on the sides of peppers. Tip burn may also occur on many ornamentals and flower buds and petals resulting from the same causes. When plants so affected are placed under stress, normally during high temperatures and moisture stress, the edges of young soft growth collapse. As the tissues age the dead margins dry out and do not expand, tip burn is seen that results in a cupping of the affected areas. (Typical injury - right - on lettuce showing necrosis and raddichio showing cupping)

While it can be associated with low calcium levels in the nutrient solutions this is not the normal cause in hydroponics crops. In most instances it is due to inadequate movement of calcium to plant extremities in two stressful situations. When high temperatures prevail rapid transpiration does not support movement of calcium ions. In highly humid cool conditions inadequate transpiration is present to carry sufficient calcium ions into the plant. Calcium is a large molecule and has difficulty moving into and through the plant. When these adverse conditions apply, and rapid plant growth is occurring, low levels of calcium may also result from dilution due to rapid leaf expansion. High (excessive) nitrogen can cause this situation.

Temperature control. Many lettuce varieties and leafy plants are susceptible to tip burn when temperatures at plant height are above 25C for 10-20 minutes. Tip burn resistant lettuce varieties will tolerate temperatures of about 27-28C. A few varieties (especially of the oak leaf types) will tolerate higher temperatures. Fogging and misting above the plants will effectively reduce temperatures, providing the relative humidity is low. Soft waters are required for this or leaves will turn white with the soluble salts left as the water evaporates. In summer use of 35% shade also assists to reduce temperatures.

High humidity. During periods of high humidity increasing ventilation and air movement with fans assists control. Application of recommended calcium foliar sprays is helpful.

Low Humidity. Under low RH conditions, usually associated with higher temperatures, tip burn can occur in under twenty minutes exposure to high temperatures. Careful venting to reduce temperatures, frequent fogging and misting and application of shade to high light zones can eliminate tip burn. Leaves should be only slightly moist and bursts of fog every few minutes for a few seconds achieves lower temperatures and higher humidities.

Sodium levels. Sodium competes with calcium and high sodium levels can result in severe tip burn. Sodium is not used by the plant and levels in the tank will increase as water is used by the crop. In summer levels of sodium of 20ppm at cF9, 30 ppm or more at cF12 or >60ppm at cF 25, (as used on many ornamental and fruiting crops) will restrict plant growth and interfere with calcium uptake. Sodium levels in the water supply of 5ppm are readily managed. Most rain water is below 4ppm. Waters with 5-12ppm require frequent dumps. Waters with above 12ppm sodium are increasingly unsuitable for lettuce production without treatment to lower sodium and proportionately higher ppm have the same effect on peppers and tomatoes and crops growing at higher cF's. Reverse osmosis is the preferred treatment to lower sodium because of the varying pH present after regeneration of the alternative ion exchange resin systems. Alternatively, rainwater may be collected. Water from many streams is also low in sodium but requires disinfection before use.

Pythium root infections. Pythium lowers the calcium level in the plants and this organism also readily infects and thrives on plant roots with low calcium. This and other root disorders are frequently associated with tip burn.

Control of Tip Burn and related problems.
Environmental Control
Managing the humidities and temperatures within the guidelines given above are important first line measures that should always be used.

cF management. Calcium is taken up by the plant more readily at lower cF levels. Running leafy green systems at a cF of 8 (but no less) in the day time and higher at night (to achieve an average cF of 12) almost eliminates tip burn. Similar lowering of the cF will assist control on other crops. If the cF is lowered too much the nutrient solution will become very unbalanced and nutritional problems will reduce growth.

Control Root Disorders.
There are many effective means for preventing and eliminating losses from root disorders that should be used to prevent these contributing to losses. Seek assistance to identify the organisms and apply appropriate control measures.

Calcium sprays. Under many conditions application of Calcium EDTA at 10g/10L + Latron B1956™ spreader at 2ml/10L, as a wet spray applied every 5-7 days, has given effective control during adverse periods but recent formulations of Ca-EDTA have caused injury when used. Many spreaders also accentuate this injury. Promising alternatives are at present being evaluated and some organic calcium complexes and high analyses solutions of calcium chloride are of interest. If tip burn is a problem please enquire for latest advice regarding application of safe foliage sprays.