Abscisic acid treatments can prevent tomato blossom-end rot

January 14 2015

Plants are subjected to numerous environmental stresses—drought, extreme temperatures, and excess light can all affect plant growth and quality. Looking for methods to improve the quality of tomato plants, researchers at the University of Tennessee turned to abscisic acid, a plant hormone known to help plants acclimate to these types of severe environmental stresses. The research results and recommendations for growers were published in *HortScience*.

According the study's corresponding author Carl Sams, abscisic acid (ABA) can have a positive effect on nutritional fluxes in plants; for example, it can promote the uptake of calcium in tomato plants. Adequate levels of calcium in tomato fruit have positive effects on fruit quality—specifically firmness—while insufficient calcium uptake and movement in tomato can result in a disorder called blossom-end rot. Blossom-end rot (BER) often occurs in plants that have an adequate calcium supply but are grown in challenging environmental conditions such as humidity, high light intensity, and high temperatures, all of which inhibit transport of calcium to plants' rapidly growing distal fruit tissue. Blossom-end rot can also occur when plants experience increased demand for calcium in the early stages of fruit development.

Sams and coauthors T. Casey Barickman and Dean Kopsell designed experiments to examine how root and foliar spray abscisic acid applications affect the "partitioning" of calcium between the leaves and fruit of tomato plants, especially in the distal fruit tissue. The study also examined how root and foliar spray ABA applications, individually and

in combination, affect the incidence of blossom-end rot in the distal tissue of tomato fruit.

The researchers grew tomatoes hydroponically in a greenhouse and treated the plants with different calcium concentrations. Calcium was applied through the irrigation lines at 60, 90, or 180 mg L^{-1}. ABA treatments were applied as a combination of foliar sprays and root applications. Foliar ABA applications treatments consisted of a deionized water control (no ABA) or 500 mg ABA/L. Abscisic acid root application treatments consisted of a deionized water control (no ABA) or 50 mg ABA/L applied through the irrigation lines. ABA spray treatments were applied once weekly until dripping from the foliage; root applications were applied four times per day through the irrigation system. The scientists then harvested and analyzed tomato fruit tissues and leaves for calcium concentrations.

"Our results demonstrated that applications of ABA treatments decreased calcium concentration in the leaf tissue," the authors said. "The most significant decrease of calcium concentration occurred with the combination foliar spray and root applications of ABA treatments. However, foliar spray and root ABA treatments individually were as effective in inhibiting calcium uptake into the leaf tissue as the combination ABA treatment." The analyses also showed that as the applications of ABA treatments decreased calcium concentrations in tomato leaf tissue, the concentrations of calcium in tomato fruit tissue increased. The results demonstrated that ABA applications significantly increased calcium concentration in the distal tissue of the tomato fruit.

The scientists added that ABA treatments are effective in the early stages of plant development, but are not enough to completely combat calcium deficiencies in the later stages of fruit growth. "Additional treatments such as increasing the frequency of ABA applications or the treatment concentration of ABA, applying calcium spray treatments, or

slowing down the rapid growth of the plants by manipulating the greenhouse environmental parameters such as relative humidity, light, and temperature may be needed to ensure adequate uptake and distribution of calcium throughout the harvest period," they said.

More information: The complete study and abstract are available on the ASHS *HortScience* electronic journal web site: hortsci.ashspublications.org/c … /49/11/1397.abstract

Provided by American Society for Horticultural Science