e-GRO Edible Alert

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Supplementing silicon with container-grown edible crops

Container-grown edible crops are becoming increasingly popular among consumers, and greenhouse operations are producing more potted culinary herbs and vegetables for sale in retail supermarkets (Fig. 1). Compared to floriculture crops, the use of pesticides is undesirable and more restricted for edible crops intended for human consumption, and growers have fewer options to control plant pathogens and mitigate disease losses during production.

Supplemental applications of silicon (Si) during production may be a strategy to help growers mitigate the incidence of disease. Other reported benefits of supplemental Si include resistance to drought stress and wilting. Past research with floriculture species have also shown supplemental Si applications can reduce disease pressure and increase plant quality.

This e-GRO Edibles Alert highlights some potential benefits of supplementing Si in the applied fertilizer program for container-grown crops, and summarizes some recent research on Si with potted edibles.

Figure 1. Common examples of container grown herbs found at popular retailers. Container grown herbs are often packaged in plastic sleeves.

Why supplement the fertilizer program with Si?

Silicon is a major constituent of many mineral field soils, and although not considered an essential plant nutrient, Si can have beneficial effects on plant growth during crop production. For some crop species, Si uptake increases plant resistance to fungal diseases, particularly powdery mildew. Other reported benefits include greater resilience to UV light, extreme temperatures, nutritional disorders, drought and wilting. Crops grown in soil typically accumulate Si in concentrations ranging from 0.1% to 10% of plant dry weight.

Container-grown plants accumulate low amounts of Si compared to field production, primarily because the soilless growing substrates, applied fertilizers, and irrigation water sources used are typically low in Si. Supplemental Si applications during production have reduced disease pressure and increased plant quality with floriculture crops, where Si was supplied by incorporation into the growing substrate, dissolved into the applied fertilizer solution, or as a foliar spray. Little research has evaluated supplemental Si applications with container-grown edible crops.

Research at the University of Arkansas evaluated Si foliar sprays and substrate drenches for effects on Si uptake, plant growth, and morphology for a range of container-grown edible crops including basil, cucumber, parsley, rosemary, thyme, and tomato. All crop species had increased Si in shoot tissues in response to supplemental Si, especially parsley, and drenching with soluble Si was more effective at increasing shoot Si levels compared to Si foliar sprays. Overall, species differed in tissue Si regardless of supplemental Si application, and cucumber was labeled as a Si "accumulator."

All species accumulated some Si in shoot tissues even when no supplemental Si was applied, indicating trace amounts of Si were likely supplied by the spray solution surfactant, growing substrate, water-soluble fertilizer, and/or water source.

Supplemental Si did not impact plant growth, but caused distorted leaves in parsley. In Fig. 2, we can see parsley drenched with Si from potassium silicate were more compact with shortened petioles, almost resembling a rosette-type growth habit. In addition, leaf margins were more finely-serrated, and younger leaves developed symptoms of marginal necrosis (burned, browned tissue) with extra Si.

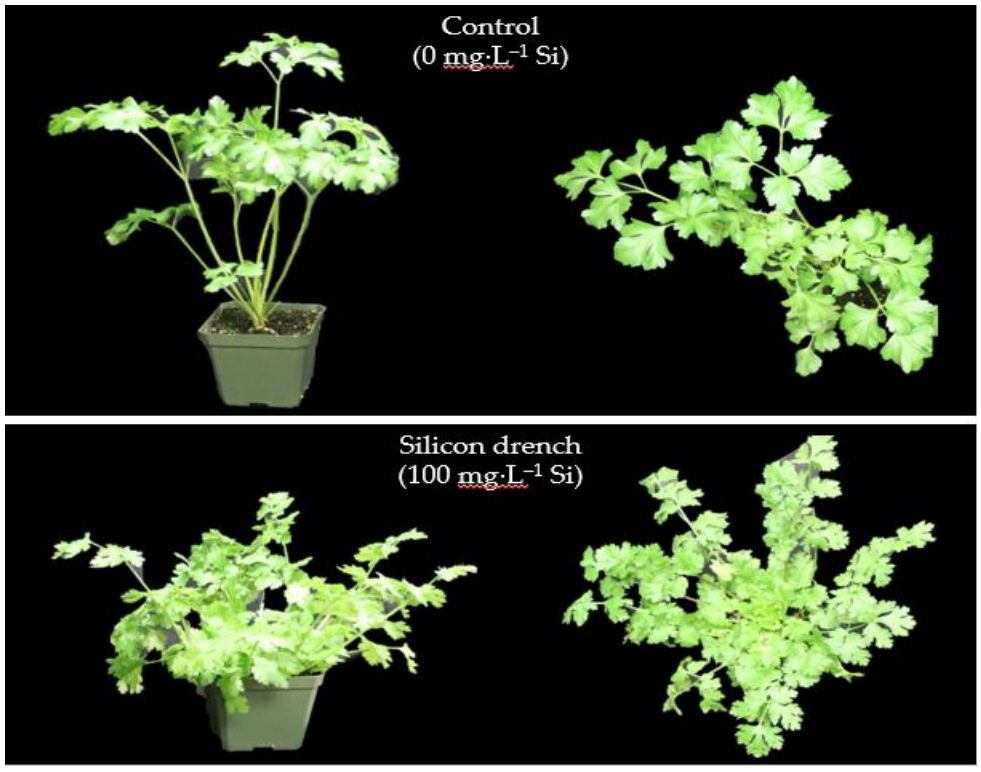

Figure 2. Parsley that has been treated with supplemental silicon (Si) during production compared to parsley that was not treated. Supplemental Si led to stunted growth and necrotic leaf edges.

Take-aways…

- Supplemental Si applications can provide benefits to certain crops species such as increased disease resistance. Our research has shown with common container-grown edibles (basil, cucumber, parsley, rosemary, thyme, tomato) that supplemental Si foliar sprays and drenches are effective at increasing Si in plant tissues.

- Potassium silicate products are water-soluble sources of Si suitable for foliar sprays and drenches. Foliar sprays of 100 to 500 ppm Si and drenches of 50 to 100 ppm Si are common.

- Rice hulls and silicate slag materials can be incorporated into growing substrates as a slow-release source of Si. It is important to note incorporating rice hulls can influence substrate physical properties (air and water-holding capacity, bulk density, particle size distribution). Also, slag materials can raise substrate pH, and may require growers to reduce the amount of incorporated limestone.

- Too much Si can cause growth distortions, as shown with parsley in Fig. 2. Growth distortions have also been shown with certain floriculture species, such as zinnia and sunflower. It is important to trial supplemental Si applications on a small scale before the entire crop.

<u>Literature used:</u>

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