

GROWERTALKS

Features

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A Silicon Story

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See the [digital edition of the February GrowerTalks](#) for the table and figures.

While silicon is not yet considered to be an essential nutrient for most plants, it's been utilized for years in agriculture because of its many, well-documented benefits to plants. Silicon enters plant roots as silicic acid. Once inside the plant, it travels rapidly to active growing points, where it complexes with organic compounds in the cell walls, making them stronger. Stronger cell walls lead to stronger plants. Increased tolerance to heat, salt and drought stress, resistance to pathogen and insect infestations, stronger and thicker stems, and shorter internodes are among the reported benefits of silicon to plant growth and development.

Silicon exists in the Earth's crust, in an abundance that's second only to oxygen. Many plants accumulate it in large concentrations, in amounts similar to macronutrients. Plants grown in mineral soils (natural environments, field soils or gardens) have ready access to it. On the other hand, silicon isn't prevalent in peat moss, bark or any other components of the soilless substrates that are commonly used today for producing containerized horticultural crops.

The trials and a new mix

Sun Gro launched an extensive research program to evaluate the benefits of incorporating silicon into their professional and retail growing mixes. This project encompassed trials to evaluate silicon sources and incorporation rates, as well as plant growth responses of more than 40 commercially important annuals, perennials and vegetables. Plants were trialed in seed and cutting propagation experiments, and in finished production from transplant through post-harvest dry down. For all of our "grow" trials, substrate pH and EC were monitored weekly or bi-weekly. Degree of rooting was rated on a scale of 1 to 5 at about four weeks after transplant. Number of days from transplant to various developmental stages was recorded. When plants reached "market" stage, several shoot-growth parameters were measured and plants were placed into a post-harvest dry down when the time was recorded from last watering to wilt.

Silicon can be added to a substrate in several forms and can be obtained from many sources. Sun Gro holds the patent on substrate incorporation of silicon in any form. In our initial trials, several silicon sources and rates were evaluated. Based on concentrations of silicon in media and leaf tissue, and overall plant

performance, we zeroed in on an optimal silicon source and rate.

At that point, it was time for a plant trial “blast.” We tested 14 commercially important spring annuals grown in peat- and bark-based mixes. Seed germination trials with vegetables, annuals and ornamental grasses were also conducted. Positive results from these proof-of-concept tests led to the creation of silicon-containing Resilience mixes. (Resilience is Sun Gro’s brand name for patented growing mixes enriched with silicon.)

Trialing the new mix

In the next set of trials, summer annuals, perennials, vegetables (direct-sown in jumbo 6-packs) and poinsettias were grown in Resilience mixes that were made “on the line” at Sun Gro’s manufacturing facility in Anderson, South Carolina. Testing also included plug production trials with seeds and cuttings in Resilience germination/propagation mixes.

Although growth responses to silicon varied among plant species and even cultivars, there were some general trends that were prevalent in most plants. Annuals and vegetables that exhibited positive growth responses in Resilience mixes were compiled (see Table 1). Compared with our standard mixes, and based on a root rating scale, the Resilience-grown plant roots were visible in up to 40% more of the substrate. Better rooting enhances nutrient uptake and provides greater support for the shoots (Figure 1). Plants grown in Resilience took up to 77% more hours to wilt after water was withheld (Figure 2). This translates into increased shelf life in retail settings. Resilience mixes promoted thicker stems and earlier flowering—up to 12% increase in stem diameter and up to 13% earlier flowering (Figures 3 and 4). In finished production, earlier flower development equals fewer days to market. In addition to these typical responses, Resilience-grown poinsettias also had stronger and thicker branches, and were more compact with denser foliage than those grown in the standard mixes (Figure 5).

Silicon and germination

Plug production is inherently different than finished plant production. Growth measurements were evaluated on the entire plug tray rather than individual plants. Germination percentage was obtained on the seed propagation trials at 10 days. For both seed and cutting propagation trials, other measurements were taken when the trays were at “market” stage. Stand (percentage of yield) was assessed on entire trays. Root growth ratings and stem diameter were also collected.

Germination percentage was equal between standard and Resilience mixes. Similar to what we saw in finished production, Resilience plugs had up to 97% better rooting and up to 33% thicker stems (Figures 6 and 7). Plugs are considered to be market-ready when the whole plug can be easily pulled from the tray—intact. Since roots help hold the plug together, enhanced rooting equates to fewer days to market. Thicker stems mean less damage to young plants during shipping and transplant.

Satisfied that Resilience mixes worked well for most peat- and bark-based mixes, we turned our attention to mixes containing coir or high amounts of vermiculite and organic mixes. Also, we trialed Resilience mixes with the addition of biologicals and with PGRs to be certain that Resilience mixes wouldn’t interfere with these commonly used products or cause interactions that could be harmful to plants.

At this point, numerous commercially important horticultural crops have been trialed in several different

soilless substrates in many types of plant production schemes. Most of this work has been accomplished at the Sun Gro Horticulture Discovery Center. Additionally, there have been several Resilience mix trials conducted independently at universities and with professional growers who have seen the same results of better rooting and thicker stems.

After such thorough evaluation, we're confident that Resilience mixes enhance containerized plants by providing them with a beneficial element that, until now, hasn't been available in soilless substrates. Sun Gro offers Resilience mixes that are appropriate for most growing situations—from seed and cutting propagation to finished production—for our professional and retail customers. **GT**

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