GROWERTALKS

Culture Notes

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CRFs on Mums

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Combining water soluble and controlled-release fertilizer programs to optimize plant growth and protect water quality

Good land stewardship is becoming more important for the floriculture industry as the public demands that the U.S. horticulture and agriculture industries become sustainable and green. This is especially true on Long Island where the greenhouse and nursery industries are the largest in New York and water quality (both open water and aquifers) is a major issue. With an estimated 1 million-plus potted mums grown on Long Island, water and leachates from these plants are important issues.

As potted garden chrysanthemums are fertigated, there's the potential for nitrates and other nutrients to leach from the pots into the ground. Certain types of soils, especially sandy soils, expedite leaching into the groundwater. The frequency of fertigation determines the amount of leachate produced. Over-fertilization can translate into operating losses and can lead to the contamination of ground and surface waters. Chrysanthemums require large quantities of fertilizer during the early, vegetative stage of growth. Typically, 250-300 ppm is applied to potted plants as a constant liquid feed and continues through bud set. Then, as flowers begin to open, the fertilizer is discontinued, ensuring an improved postharvest quality. Controlled-release fertilizers (CRFs), also referred to as slow-release fertilizers, can be a good alternative. CRFs can reduce nitrogen leaching and therefore reduce environmental impact. In addition, CRFs only need to be applied once at the beginning of the crop cycle.

During the summer of 2007, several experiments were conducted at Cornell University's Long Island Horticulture Research Center with CRFs and potted garden mums. Both Sungro and Scotts participated in the project by supplying their CRFs Multicote and Osmocote, respectively.

This research attempted to answer:
1.) Can outdoor potted mums be grown by solely using a CRF?
2.) Is there a way to reduce the amount of liquid fertilizer (LF) by using it in combination with a CRF fertilizer?

The cultivar Bold Vanessa was used for the experiments that used Osmocote CRF and the cultivar Olivia was used for the experiments that contained Multicote CRF. All rooted cuttings were planted during the week of

June 18 into 9-in. plastic mum pans in either Sunshine #8 mix or SB400 bark mix. There were at least six replications per treatment for all experiments; pots were positioned in a randomized block design to allow for statistical analysis. CRFs were incorporated into the growing medium. Control plants received 250 ppm constant LF at each watering. Data were collected on the number of days to first color and full bloom. At the full bloom stage, the plant height, width and fresh weight were measured.

Experiment #1 – Effect of rate and CRF formulation

Part 1 of the first experiment compared the effects of three rates of CRF application (high, medium, and low), with three formulations of Osmocote Plus CRF. The Bold Vanessa mums were grown in the field and potted in Sunshine #8 mix (no bark). Liquid fertilizer was only used for the control plants.

When all treatments were compared, the plants that received liquid fertilizer (LF) throughout their growth were the largest plants with a greater fresh weight than any of the other treatments. The height and weight responses of the mums receiving the other three treatments responded in similar trends, but all were smaller than the control plants. The low concentrations of the CRF treatments produced the smallest plants while the highest CRF concentration produced larger plants. The control treatment took from two to 10 days longer to flower than any of the other CRF treatments. There was no clear pattern in the number of days to flower response of the CRF treatments. High nitrogen levels will often delay the flowering of chrysanthemum plants. This result indicates that the LF control plants had higher nitrogen levels at the end of their production cycle.

Part 2 of Experiment #1 again compared three rates of CRF application with three formulations but this time used Multicote CRF. The Olivia mums were potted in SB400 bark mix. Liquid fertilizer was used for the control plants.

This experiment showed the same trend as in Part 1; however, the degree of response was different. Control plants were larger overall and were taller, wider and heavier. There were no significant differences between the three different rates of application and there were no differences between the three types of CRF. All of the CRF treatments responded similarly but less than the control plants. Although none of the CRF treatments in Experiment #1 were as large as the LF plants, the CRF products produced nice looking, marketable plants.

Experiment #2 – Combination CRF plus liquid fertilizer

The second experiment combined both CRF and early applications of LF for the first two, four and six weeks of production. For this experiment, only the eight-to-nine-month formulation of Osmocote Plus was used and all pots received 8.5 lbs./yd^3. Control plants received constant LF and did not receive any CRF. The zero-, two-, four- and six-week treatments contained Osmocote Plus but also received 250 ppm LF each time they were watered but only for the specific amount of time being tested (two, four or six weeks).

The results from these experiments were exciting and demonstrated that by giving the chrysanthemums four to six weeks of LF plus incorporating a CRF, you can produce a plant that's as large as one that receives LF throughout its entire production life. The height of mums that only received CRF was much shorter than any of the other treatments. The plants that received LF for the first two weeks of production were larger, and the plants that received LF for the first four or six weeks grew to a size that surpassed the control plants. These size differences were confirmed by both width and fresh-weight data. There was a steady increase in the width of the plants as they

received additional weeks of LF. The fresh weight data mirrored this trend. It was interesting to note that the LF control plants looked the same as plants that only received four or six weeks of LF. However, the fresh weight of the LF treatments was surprisingly less than the control plants.

The data that examined the number of days to flower in this experiment was clearer than in Experiment #1. As in the first experiment, the control plants that constantly receive LF took the longest time to flower. The four- and six-week LF treatments took longer to flower than the zero- and two-week treatments, but two to three days less than the control plants.

Plants that received only four or six weeks of LF looked similar to the control plants in size. However, the control plants were slightly darker green than the treated plants. This shouldn't be a major issue since the leaves aren't visible when the plants are in full bloom. The slight color difference is only detected when LF plants are next to CRF plants. If this leaf color difference is a concern, you can correct the lighter green leaf color by applying a single dose of liquid fertilizer about 10 days before sale.

Experiment #3 – Growing in a bark mix

The third experiment compared the growth of Olivia mums planted in either Sunshine Mix #8 or Sunshine bark mix SB400. All plants received constant liquid feed for their entire production until first color on the buds. Plants that grew in the Sunshine Mix were slightly taller, wider, and had a greater fresh weight than mums that were grown on the bark mix.

Experiment #4 – Using additional nitrogen

Since early applications of nitrogen are important to a growing potted chrysanthemum, we examined different rates of additional CRF nitrogen (N). For this experiment, the cultivar Olivia was grown in SB400 bark mix. We used CRF Multicote 15-7-15, 4-month release formulation at 1.5, 1.75 and 2 lbs. N/yd. To each of these, an additional 0.75, 1.5 or 2 lbs./yd. of Nitroform Blue Chip (38-0-0) was added. Only control plants received LF.

The results were the same as in Experiment #1 where the control plants that received LF were larger than any of the other treatments. The combination of Blue Chip with the highest N rate of 2 lbs. N/yd. produced slightly larger plants than the 0.75 and 1.5 treatments. The amount of Blue Chip in any of the treatments did not make a significant difference in growth.

Conclusions

These experiments clearly demonstrate that if you want to produce the largest mum plant possible, then liquid feed is an important component of the production schedule. A constant LF program that feeds the plant until the flower buds show color is the traditional protocol. However, if the amount of liquid feed is to be reduced, a program that combines CRF with a LF for the first four to six weeks of production will produce a plant of equivalent size and quality.

The experiments that solely used a CRF for the nutrition of a potted chrysanthemum produced a nice, marketable plant. However, the size of the plants was not as large as plants that received LF or a combination of CRF and LF. During the 2008 growing season, experiments will test higher concentrations of CRF on mums. In addition, different types of CRF with different nitrogen release times will be tested. If a CRF

can provide higher nitrogen levels during the first six weeks of production, a larger plant should result.

It's obvious that CRFs can be an excellent alternative to soluble fertilizer. However, there are still more questions to be answered. Most importantly, will the amount of leachate produced from pots grown with CRF be less than the amount produced when LF is used? Are the differences in growth from using a bark-based growing medium significant, and how can these differences be offset? Can a CRF be identified that will produce a mum plant that's as large as a plant that has had constant LF? A CRF program shows potential for growers to provide outdoor potted chrysanthemum plants with proper nutrition while reducing nitrate contamination in ground waters.

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Editor's Note: ***Graphs and photos may be viewed in the print version of the June 2008 issue. However, due to space constraints in the print edition of GrowerTalks, we were unable to print all 17 of the graphs that illustrate these research results. If you'd like a copy of the full set of graphs, just send an e-mail to jwhite@ballpublishing.com. We'll get the info right to you!***