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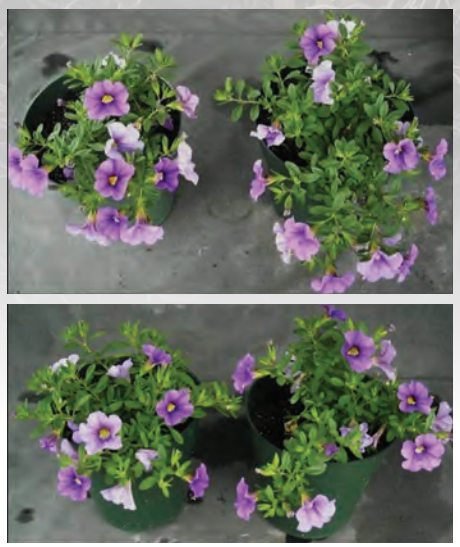
Bedding Plants and CRFs

From bedding plant propagation to finishing, studies reveal how controlled-release fertilizers stack up against traditional water-soluble fertilizer programs.



This photo, taken six weeks into the treatments, shows *Calibrachoa* 'Cabaret Lavender' grown with 100 (low) or 200 (high) ppm WSF (top) or 3.3 (low) or 5.7 (high) lbs./yd^3 CRF (bottom).

by **CHRISTOPHER J. CURREY, ROBERTO G. LOPEZ, NEIL S. MATTSON** and **BRIAN A. KRUG**

WHILE controlled-release fertilizers (CRFs) are not a recent addition to a grower's toolbox, they are not nearly as common as traditional water-soluble fertilizers (WSF). Many growers comment that they don't want to lose the control they have with traditional WSF programs. However, new formulations and technologies in CRF manufacturing, along with a desire for alternative methods of delivering mineral nutrients, have led to increased interest in using CRFs.

The experiments below focus on using CRFs in greenhouse propagation and finishing of short-term bedding plant crops.

How Fertilizer Studies During Propagation Were Conducted

At Purdue, cuttings of several cultivars of angelonia, geranium, nemesia, New Guinea impatiens and petunia were stuck in 105-cell propagation trays filled with 3 parts soilless substrate and 1 part perlite. The trays either contained no fertilizer charge or 5, 10, 20 or 40 pounds of Osmocote Plus 15-9-12 with micros CRF per cubic yard of substrate. This corresponded to roughly medium or 1, 2 or 4 times the high label rates. Some cuttings were placed under a clear acidified water mist, while a set of cuttings in the substrate mix without CRF were placed under mist containing 50 parts per million (ppm) nitrogen from a balanced feed. Four weeks after the start of propagation, cuttings were harvested to assess growth, development and tissue nutrient concentration.

One of the most important considerations to propagators is root growth. Interestingly, both CRF and WSF resulted in cuttings with less root growth than unfertilized cuttings. While root growth was reduced for fertilized cuttings, all cuttings were fully rooted and "pullable" at the end of four weeks of propagation. Stem length, however, tended to increase with the amount of CRF incorporation rates. While this may persuade growers to use less fertilizer to control shoot growth, the data showed that tissue concentrations of macronutrients (primarily nitrogen, phosphorus and potassium) only reached acceptable levels when higher rates of CRF or WSF were used.

Growers concerned about the cost of using higher fertilizer rates (20 and 40 lbs./yd^3) during propagation should keep in mind that while the amount of CRF incorporated is high, the actual amount of substrate and CRF used in a propagation tray is minimal. Using a standard wholesale price, 20 to 40 lbs./yd^3 of CRF comes out to $0.15 to $0.30 per tray and, when taken together with the high value of a tray of rooted cuttings, this is a relatively minimal cost.

How Fertilizer Studies For Finishing Of Short-Term Bedding Plants Were Conducted

At Purdue, *Argyranthemum* 'Madeira Cherry Red', *Bacopa* 'Abunda Giant White', *Calibrachoa* 'Cabaret Pink', and *Diascia* 'Wink Coral' were transplanted into 5-inch containers filled with a soilless substrate containing no CRF, 3.5 or 5 pounds per cubic yard (lbs./yd^3) Scotts Osmocote Plus 15-9-12 with micros, or 5 lbs./yd^3 Osmocote Bloom 12-7-8.

Plants in the CRF treatments were either hand irrigated with unacidified (pH 7.6) or acidified (pH 6.3) water. Plants with no CRF were irrigated with unacidified water containing 200 ppm N from Peters Excel 21-5-20, Daniel's 10-4-3, Scotts Flowering Crop Special plus Iron 15-3-25 or Jack's Petunia FeED Plus Mg 20-3-19. Additionally, plants growing in a substrate containing 3.5 lbs./yd^3 Scotts Osmocote Plus were also fertilized with 100 ppm N, from a balanced WSF (Peters Excel 21-5-20).

At the University of New Hampshire, *Impatiens* 'Super Elfin XP Violet' and *Geranium* 'Americana Orchid' were planted into 4.5-inch containers filled

These photos show rooted cuttings of *Angelonia* 'Sundancer Yellow' (bottom) and *Petunia* 'Cascadia Marshmallow Pink' (top) cuttings propagated in substrate containing 0, 5, 10, 20 or 40 lbs./yd^3 15-9-12 CRF or 50 ppm WSF four weeks after the beginning of propagation.

with soilless substrate containing 0, 2, 4 or 6 lbs./yd^3 Florikote 14-4-14 CRF. Plants growing in substrate with 0 or 2 lbs./yd^3 CRF were also fertilized with 150 or 50 ppm N, respectively, from a balanced WSF (Poinsettia FeED 15-4-15).

At Cornell, *Calibrachoa* 'Cabaret Lavender' and *Impatiens* 'Celebration Icy Blue' were transplanted into 6-inch containers filled with soilless substrate containing 3.3 or 5.7 lbs./yd^3 Osmocote Plus 15-9-12 CRF. Plants with no CRF were irrigated with 100 or 200 ppm Jack's Pro 21-5-20. The plants were grown for six weeks and were drip-irrigated with water supplemented with fertilizer (WSF treatments) or clear water (CRF treatments).

Plants Respond Differently To CRFs

At Purdue, one overwhelming trend in plant height or stem elongation at flowering was observed and can simply be summarized as controlled-release fertilizer equals controlled growth. In general, root dry weight was not affected by fertilizer treatments; however, fertilizers affected shoot weight (plant size) of species differently. For argyranthemum, shoot dry weight of plants grown in CRF was reduced, whereas there were no significant differences across fertilizer treatments for bacopa, calibrachoa and diascia.

After seven weeks at the University of New Hampshire, the visual quality rating of 'Americana Orchid' geraniums grown with 150 ppm WSF, 50 ppm nitrogen WSF + 2 lbs./yd^3 and 6 lbs./yd^3 CRF were all similar and were considered good or very good, whereas plants grown with 2 lbs./yd^3 were small with a little leaf chlorosis.

A similar trend was observed for the dry weight and growth index (a combination of height and width) for geraniums, with higher rates of CRF and/or WSF producing plants of similar appearance and quality. For impatiens, plants grown with WSF, CRF + WSF and 4 or 6 lbs./yd^3 CRF had similar visual ratings, dry weight and plants size, while plants grown with 2 lbs./yd^3 were of lower visual quality and smaller.

At Cornell, CRF produced fairly comparable bedding plants to their WSF counterparts. The largest New Guinea impatiens were grown with 100 ppm N from WSF or 5.7 lbs./yd^3 CRF. Plants grown in 3.3 lbs./yd^3 were 10 to 20 percent smaller. Interestingly, calibrachoa, a moderate feeder, were largest at the lower rate of WSF or CRF, while plants were slightly smaller at the higher fertility treatment. The larger amount of substrate in the 6-inch containers used at Cornell, along with its starter charge, may have meant that lower fertility treatments still provided adequate fertility.

Use Both Fertilizers To Make Transition From WSFs To CRFs

When switching to CRFs, growers should initially transplant crops into larger containers (ie. 5- to 6-inch) until they feel comfortable with CRFs. Larger containers (and their substrate) will have a larger quantity of nutrients in the starter charge and, if CRFs are applied on a per-volume basis, a greater amount of nutrients from the CRFs will be available too.

When using smaller containers, it can be more difficult to ensure that the CRF granules are incorporated into the substrate well enough to ensure their application is uniform from container to container. As the propagation study indicated, using smaller container sizes may necessitate using CRFs at greater than recommended label rates to ensure enough mineral nutrients are available in small containers and in shorter-term crops.

One technique to mediate risk associated with using only CRFs or to make a gradual transition from WSF to CRF is to use a combination of both fertilizers. At both Purdue and University of New Hampshire, using lower levels of CRF and WSF together resulted in growth comparable to plants fertilized with only WSF or CRF. There is clearly room for CRFs in a grower's toolbox for bedding plant propagation and finishing. **GG**

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