e-GRO Alert

W. Garrett Owen
owen.367@osu.edu

Volume 12 Number 13 March 2023

Proper Application of Controlled-Release Fertilizers

Controlled-release fertilizers (CRFs) can be either incorporated or top-dressed for containerized crop production. Proper application procedures and methods will determine success.

The goal of any greenhouse fertility program is to deliver containerized crops with adequate mineral nutrients to meet plant growth requirements and produce high-quality, marketable plants. Water-soluble fertilizers are the most common and widely used source to provide nutrients to containerized crops. Controlled-release fertilizers (CRF; Fig. 1) can be used as an alternative or in combination with water-soluble fertilizers to successfully provide containerized crops with nutrients. There are many reasons why growers may implement CRFs into their fertility program; however, common explanations from growers include:

Figure 1. Example of a commercially available controlled-release fertilizer.
Photo by: W. Garrett Owen.

1. Standard production protocol.
2. Limited or no access to nutrient solution in the growing environment.
3. Nutrients available in the root-zone after a rainstorm for outdoor-grown crops.
4. Desire to reduce water-soluble fertilizer rates.
5. Nutrient availability for consumer success.

Success with CRFs begins with selecting the appropriate formulation and release time so that the crops' nutrient needs are being met throughout the production cycle. Furthermore, growers should consider selecting a CRF with a prill size suitable for the container or cell pack so it can be successfully integrated into your production regimen. Finally, procedures by which CRFs are applied impacts success and may translate to labor or water-soluble fertilizer savings.

Controlled-release fertilizers can be applied before or after filling containers and transplanting young plants. The first procedure is to incorporate CRFs into the soilless substrate (Fig. 2). This method requires a known weight of fertilizer to be blended into a known volume of substrate to achieve the recommended nitrogen concentration. Substrate mixing equipment is often required to achieve a uniform distribution of CRFs. If not mixed thoroughly, uneven CRF distribution can occur causing uneven root-zone electrical conductivity (EC) and plant growth challenges. Furthermore, substrate mixing, and container or flat filling equipment may crack or crush CRF prills leading to inadequate nutrient availability and delivery during the cropping cycle. Alternatively, CRFs can be incorporated on a pot-by-pot basis just after containers are filled with substrates but prior to transplanting young plants. For instance, while on a grower visit, I saw a grower place the recommended rate of CRFs on the surface of substrate-filled 12-inch hanging baskets (Fig. 3). The CRF was incorporated into each container using a drill equipped with an eggbeater (Fig. 4) although a paint or mud mixing paddle or fork can be used. This method helps control pot-to-pot variation and reduce the likelihood of damaging CRF prills; however, it requires labor and is restricted

Figure 2. Controlled-release fertilizer incorporated or blended into the soilless substrate. Photo by: W. Garrett Owen.

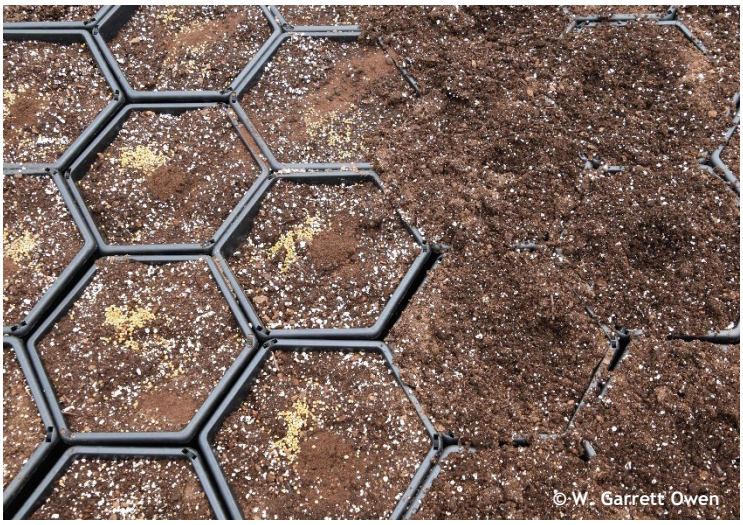

Figure 3. Controlled-release fertilizer to be incorporated into each 12-inch hanging basket on a pot-by-pot basis. Photo by: W. Garrett Owen.

Figure 4. Controlled-release fertilizer incorporated into each 12-inch hanging basket using a drill equipped with an eggbeater. Photo by: W. Garrett Owen.

to containers larger than 6.5-inches. Therefore, growers should consider the tradeoffs of incorporating CRFs at a large scale for all container sizes versus pot-by-pot basis.

The second procedure for applying CRFs is top-dressing the substrate. This method allows a known volume of CRF reported on the fertilizer label to be applied to the substrate surface. The CRF prills can be placed in one location as a mound (Fig. 5) or scattered across the top. The general rule of thumb when 'mounding' CRFs is to place the prills between the container wall and plant (Fig. 6). I have heard mixed reviews about fertilizer distribution when 'mounding' CRFs in containers with a single plant versus containers with a mix of plant material, so growers may want to perform in-house trials. Nonetheless, 'mounding' CRFs can be performed using scopes or dispensers (Fig. 7). In one instance, I have seen a scope modified so that CRF applicators do not need to bend over to apply the fertilizer (Fig. 8).

The second method of top-dressing CRFs is by scattering or sprinkling the prills across the substrate surface (Fig. 9). While this technique is simple, it is important to note that CRF prills may be deposited in flowers (Fig. 10A), on top of foliage laying on the substrate surface (Fig. 10B), or cling to wet leaves. Controlled-release fertilizers that contact plant material may cause fertilizer salt injury or burn leading to necrosis (death) of the plant part. Therefore, care should be taken when scattering the CRFs across the substrate surface. To learn more, refer to e-GRO YouTube video:

- Properly Applying Controlled-Release Fertilizers

Figure 5. Placing controlled-release fertilizer on the substrate surface in the form of a mound is an example of top-dressing. Photo by: W. Garrett Owen.

Figure 6. The general rule of thumb when 'mounding' or top-dressing controlled-release fertilizer is to place the fertilizer prills between the container wall and plant. Photo by: W. Garrett Owen.

Figure 7. Controlled-release fertilizers can be applied using dispensers. Photo by: W. Garrett Owen.

Figure 8. A controlled-release fertilizer scope modified so the applicator can be more efficient. Photo by: W. Garrett Owen.

Figure 9. Placing controlled-release fertilizer on the substrate surface but scattering or sprinkling the fertilizer prills is an example of top-dressing. Photo by: W. Garrett Owen.

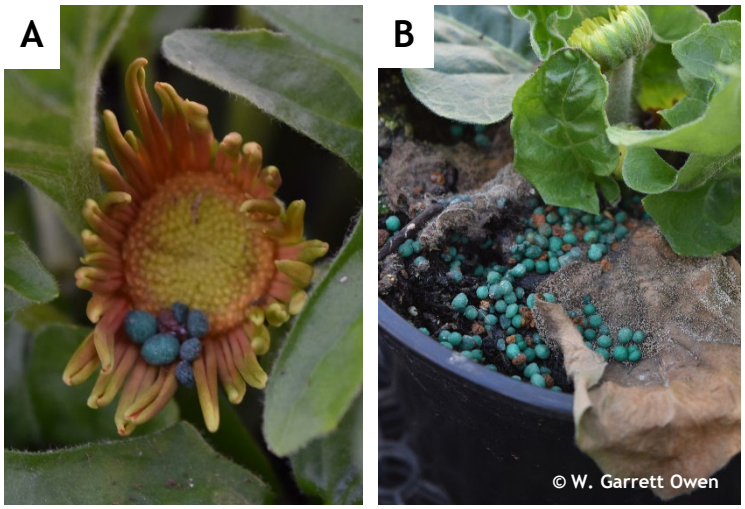

Figure 10. Top-dressing controlled-release fertilizers by scattering or sprinkling may lead to fertilizer prills deposited in flowers (A) or on top of foliage laying on the substrate surface which may cause fertilizer salt injury or burn leading to necrosis (death) of the plant part. Photo by: W. Garrett Owen.

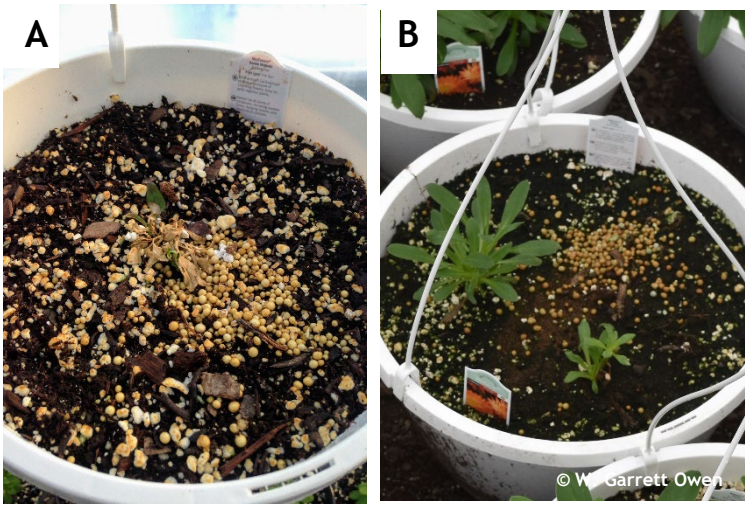

Figure 11. A controlled-release fertilizer rate that is too much for the container or has a quick release rate may cause young plants to die resulting in a total loss of single plant containers (A) or a partial loss in mixed containers (B). Photo by: W. Garrett Owen.

Finally, applying too much or too little CRF can create challenges throughout the cropping cycle. If too much CRF is applied early in the cropping cycle, then young plants may die resulting in a total loss of single plant containers (Fig. 11A) or a partial loss in mixed containers (Fig. 11B). Furthermore, growers may be challenged with managing high EC and excessive plant growth of surviving plant material. I have seen in one instance where excessive CRFs were applied by accident and manually removed to mitigate crop loss. Applying too little CRF can be beneficial if your fertility program combines CRFs and water-soluble fertilizer. Additional CRFs can be applied, however it is recommended to evaluate substrate EC prior to application to prevent overfertilization.

Overall, CRF can be used alone or in combination with water-soluble fertilizers. Growers should be aware of the different procedures and methods to properly apply CRFs and to mitigate risks. Controlled-release fertilizers can be a useful tool to simplify production, create a fertility program in restricted production environments, or to potentially provide an added consumer benefit beyond the greenhouse or garden center.

e-GRO Alert

www.e-gro.org

CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension
Suffolk County
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Thomas Ford
Commercial Horticulture Educator
Penn State Extension
tgf2@psu.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Chieri Kubota
Controlled Environments Agriculture
The Ohio State University
kubota.10@osu.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Sustainable Greenhouse & Nursery
Systems Extension & Research
The Ohio State University
owen.367@osu.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.edu

Dr. Alicia Rihn
Agricultural & Resource Economics
University of Tennessee-Knoxville
arihn@utk.edu

Dr. Debalina Saha
Horticulture Weed Science
Michigan State University
sahadeb2@msu.edu

Dr. Beth Scheckelhoff
Extension Educator - Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

Cooperating Universities

Cornell CALS College of Agriculture and Life Sciences

Cornell Cooperative Extension Suffolk County

Penn State Extension

Iowa State University

UTIA Institute of Agriculture The University of Tennessee

UConn

College of Agricultural & Environmental Sciences University of Georgia

Michigan State University

UofA Division of Agriculture Research & Extension University of Arkansas System

Purdue University

The Ohio State University

NC State University

In cooperation with our local and state greenhouse organizations

Maumee Valley Growers — Choose the Very Best.

Metro Detroit Flower Growers Association

NC Flower Power

Western Michigan Greenhouse Association

Connecticut Greenhouse Growers Association

Indiana Flower Growers Association

LIFGA

Cincinnati Flower Growers Association

Michigan Greenhouse Growers Council

NYSFI New York State Flower Industries, Inc.