e-GRO Alert

W. Garrett Owen
owen.367@osu.edu

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Optimal Emitter Placement for Drip Irrigation During Summer Bedding Plant and Garden Mum Production

Proper placement and maintenance of drip emitters is crucial for uniform irrigation and optimal growth of summer bedding plants and garden mum production.

Drip irrigation (Fig. 1) is an efficient method for delivering water and nutrients during summer bedding plant and garden mum production. Growers utilize various drip irrigation systems that range from drip tape (Fig. 2) to microtubing with metal or plastic weighted emitters or plastic drip or spray stakes (Fig. 3). The key to drip irrigation success lies in the strategic placement of emitters or stakes, which is crucial for ensuring uniform irrigation and maintaining optimal root zone conditions. Improper placement such as in the center of the plant or container (Fig. 4) or too far from the plant (Fig. 5) can lead to uneven distribution of water and nutrients, potentially causing areas of excessive moisture or drought stress within the same container (Fig 6). Over the past decade, I have observed grower challenges and

Figure 1. Garden mum production where plants are placed on drip irrigation. Photo by: W. Garrett Owen.

Figure 2. Water and/or nutrient solution can be delivered to hanging baskets (A) and containers (B) by placing drip tape with built-in emitters at pre-determined spacing across the surface of the pot. Photos by: W. Garrett Owen.

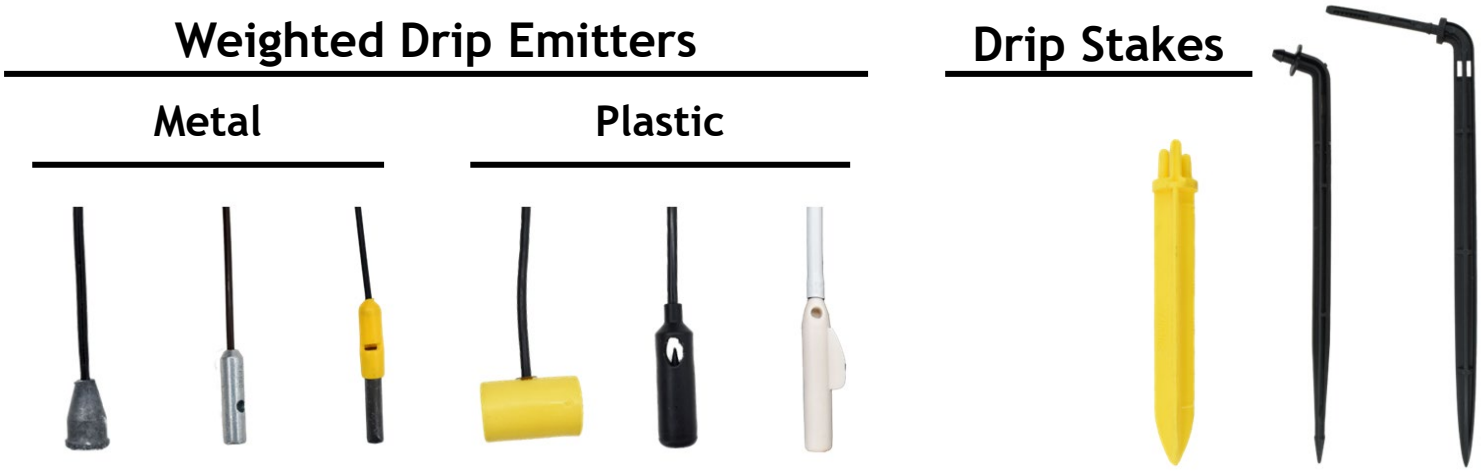

Figure 3. Examples of metal and plastic weighted emitters and plastic drip stakes used to deliver water and/or nutrient solution. Photos by: W. Garrett Owen.

successes with drip irrigation systems. Below are some key considerations when placing garden mums and other summer bedding plant crops on drip:

Emitter Placement Strategies:

1. Off-center positioning: Place emitters approximately 2 to 3 inches from the container's edge, slightly off-center (Fig. 7). This encourages even water distribution throughout the root zone.

2. Angled orientation: When using drip stakes, angle them towards the center of the container or young plant (Fig. 8). This directs water flow and allows root establishment

3. Multiple low-flow emitters: Consider using multiple lower-flow emitters per container instead of a single high-flow emitter (Fig. 9).This promotes more uniform moisture distribution and helps maintain consistent root zone temperatures.

4. Adaptive placement: As mums grow and their canopy expands, growers may need to periodically adjust emitter positions to ensure water reaches the expanding root system. This may involve moving emitters slightly outward as the plant matures.

Figure 4. Example of improper placement of the drip emitter where it was inserted in the center of the plant. Photo by: W. Garrett Owen.

Figure 5. Example of improper placement of the drip emitter where it was inserted too far from plant. Photo by: W. Garrett Owen.

Figure 6. Example of improper drip emitter placement and not enough drip emitters inserted into the container to deliver the appropriate volume of nutrient solution to maintain uniform root zone moisture levels for the age of the crop. Photos by: W. Garrett Owen.

When using drip irrigation systems, it's crucial to perform regular maintenance checks. Look for kinked or disconnected lines, clogged or removed emitters, and ensure all connections are tight (Fig 10). Additionally, wildlife such as rabbits, deer, and geese, are notorious for chewing microtubing or pulling drip emitters from containers, so it is important to walk the crop and ensure emitters are still supplying water and/or nutrient solution to plants.

In addition to strategically placing drip emitters, regular monitoring of substrate moisture levels is essential for maintaining optimal growing conditions. Growers should irrigate based on crop growth and development and weather patterns, rather than following a set schedule.

Checking the crop by lifting multiple containers, inserting a finger into the substrate, and/or using soil moisture sensors can help determine substrate moisture levels. Collecting and measuring the nutrient solution supplied to the crop is helpful when fine-tuning irrigation frequency and duration and striving to maintain a 10% leaching fraction (Fig. 11). Areas of the root ball that remain consistently wet have an increased likelihood for pathogen infection (Fig. 12) and often maintain cooler root zone temperatures compared to drier areas of the root ball. The temperature differential between wet and dry portions of the root ball can affect nutrient uptake and root development. To mitigate this issue, consider using multiple lower-flow emitters per container rather than a single high-flow emitter. This approach promotes more uniform moisture distribution and helps maintain a more consistent root zone temperature throughout the container.

For growers using controlled-release fertilizers, it's important to note that nutrient release is temperature-dependent, and nutrient movement relies on watering and rainfall. Nutrients in controlled-release fertilizers will release faster when substrate temperature is above 70°F (21°C). Frequent irrigation or rainfall can increase nutrient loss through leaching. During warm periods, excess soluble salts [also referred to as electrical conductivity (EC)] may accumulate if leaching is inadequate. To ensure proper nutrition, growers should monitor EC levels in both the substrate and nutrient solution to prevent nutritional problems before they manifest in the plant. Performing an in-house PourThru will help determine substrate pH and EC while submitting substrate and nutrient solution

Figure 7. Drip emitters should be placed approximately 2 to 3 inches from the container's edge, slightly off-center
Photo by: W. Garrett Owen.

Figure 8. When using drip stakes, angle them towards the center of the container or young plant. Photo by: W. Garrett Owen.

Figure 9. Consider using multiple lower-flow emitters per container instead of a single high-flow emitter to deliver nutrient solution and maintain optimal root zone moisture levels. Photo by: W. Garrett Owen.

samples to your preferred diagnostic laboratory will help determine pH, EC, and nutritional status so you can keep your crop on track. For more information on how to conduct a PourThru, please refer to the video on sampling containers. For sampling substrate and nutrition solution for laboratory analysis, please refer to:

- e-GRO Alert 10-1: Sampling Substrates for Routine or Diagnostic Lab Analysis
- e-GRO Alert 10-9: Sampling Irrigation Water for Routine Lab Analysis

To interpret your pH and EC data from PourThru sampling or lab analyses, refer to the crop-specific nutritional monitoring factsheets such as:

- Chrysanthemum
- Celosia
- Ornamental cabbage
- Purple Fountain Grass
- Zinnia

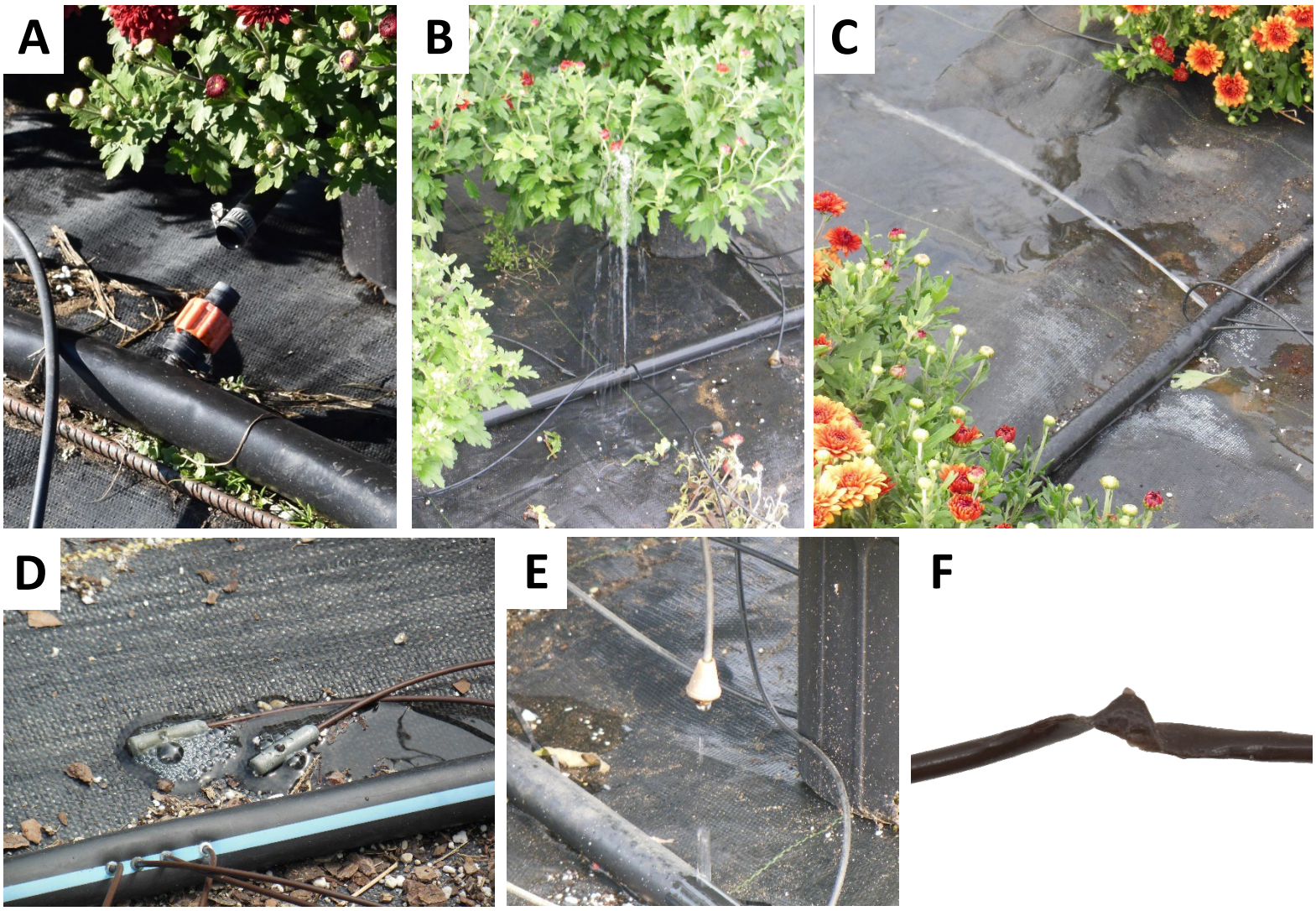

Figure 10. Examples of drip irrigation systems where maintenance is needed such as reconnecting a drip line (A), inserting emitter microtubing (B – C) into the drip line, re-inserting emitters into the container (D – E) , and repairing wildlife damage (chewing; F). Photos by: W. Garrett Owen.

By implementing these practices, growers can optimize their irrigation and fertilization strategies for garden mum and summer bedding plant crop production, resulting in healthier plants and more efficient and sustainable resource use.

Figure 11. Example of a grower collecting nutrient solution to calculate a leaching fraction and optimize irrigation frequency and duration. Photo by: W. Garrett Owen.

Figure 12. Example of a garden mum root ball where the plant was over irrigated and became infected with a root rot pathogen. Photo by: W. Garrett Owen.

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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

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

UTIA Institute of Agriculture The University of Tennessee

Iowa State University

College of Agricultural & Environmental Sciences University of Georgia

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