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Features

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Placement of Slow-Release Fertilizers

E. Jay Holcomb, Robert Berghage and Kathy Shumac

The effects of Osmocote placement on plant growth and nutrient leaching
by E. Jay Holcomb, Robert Berghage and Kathy Shumac

Soluble fertilizer is often used for the production of greenhouse crops, but one potential problem is that a substantial portion of the nutrients can be leached from the pots and if that leachate is not recycled, those nutrients can get into surface runoff or ground water. One proposed solution to the problem of nutrient leaching is the use of slow-release fertilizers.

Slow-release fertilizers have been observed to reduce nutrient concentration in the runoff from plants fertilized with slow-release fertilizers compared to liquid-fertilized plants. Other research has determined that the placement of the slow-release fertilizer, Osmocote, does not have a major impact on the growth of plants fertilized this way. Much of the research on slow-release fertilizers was done before sub irrigation became commercially widespread. Few studies have evaluated the effect of slow-release placement on nutrient leaching from slow-release fertilizers. The objectives of this research were:

1. To determine if the placement of Osmocote will affect growth of five taxa of plants.

2. To determine if plant response to the placement of Osmocote will be affected by method of irrigation.

Material and Methods

Experiment 1

This research was conducted in two experiments to evaluate if there was a seasonal aspect of the plant response to fertilizer placement. Seeds of three taxa (pansy Viola Golden Yellow, geranium Elite Cherry, and dianthus Supra Purple) were sown December 19, 2006. The geraniums were transplanted to 5-in. pots on January 5, the dianthus on January 18 and the pansy on January 22, 2007. The growing mix was Sunshine #4. The design was a split plot where some of the pots were subirrigated and the remainder were trickle irrigated as needed. There were 10 pots for each taxa for each treatment. The fertilizer used was Osmocote Exact 16-11-11 at 7 lbs./ cubic yard. The nine treatments were:

- Subirrigated plants
- Topdressed with 4 g (0.14 oz.) of Osmocote
- Middle of pot (glob), 4 g of Osmocote
- Bottom of pot (glob), 4 g of Osmocote
- Mixed throughout pot, 4 g of Osmocote
- Trickle irrigated plants
- Topdressed with 4 g (0.14 oz.) of Osmocote
- Middle of pot (glob), 4 g of Osmocote
- Bottom of pot (glob), 4 g of Osmocote
- Mixed throughout pot, 4 g of Osmocote
- Soluble 20-10-20 at 200 ppm N at each irrigation

Plants were placed in a greenhouse with a night temperature set at 60F (16C) and a ventilation temperature of 75F (24C). The pansies were harvested March 15, while the geraniums and dianthus were harvested April 2, 2007. Harvesting involved cutting the plant off at the soil level and determining fresh and dry weight.

Experiment 2

Seedlings of marigold Little Hero Orange and vinca Cooler Orchid were transplanted to 4-in. pots with Sunshine #4 on July 5, 2007, and the same nine treatments from Experiment 1 were used. After transplanting, the plants were moved to a greenhouse with a minimum night temperature of 65F (18C) and a day temperature that was above ambient. The design was a split plot where some of the pots were subirrigated and the remainder were trickle irrigated as needed. There were 10 pots for each taxa for each treatment. The fertilizer used was Osmocote Exact 16-11-11 at 7 lbs./ cubic yard. The plants grew rapidly, so the marigolds were harvested July 27 and the vinca on August 6, 2007.

Results and Discussion

Experiment 1: The growth of geranium was affected by fertilizer placement (Figure 1). It's quite clear that subirrigated plants had a much greater fresh weight than trickle-irrigated plants. Within the subirrigated geraniums, plants with Osmocote at the bottom of the pot were the largest and those plants with Osmocote placed on top were 13.6% smaller, and that difference was statistically significant. Among trickle-irrigated geraniums, those with Osmocote placed on the top were the largest; plants fertilized by Osmocote placed on the bottom had 23% less fresh weight.

Placement of Osmocote in subirrigated dianthus did not affect fresh weight nor did Osmocote placement in trickle-irrigated dianthus affect fresh weight, but subirrigated dianthus were significantly larger than trickle-irrigated dianthus (Figure 2). Pansies did not show the same trends that were evident with the other two taxa. Osmocote placement on the top or in the middle produced larger plants than bottom placement (Figure 3).

Experiment 2: Trickle-irrigated marigold plants weren't significantly affected by Osmocote placement (Figure 4). Subirrigated marigold plants with Osmocote placed in the bottom or mixed in were significantly heavier than those with the Osmocote placed on the top of the pot. Osmocote mixed with the potting mix produced plants similar in weight to those with Osmocote placed in the bottom of the pot.

Dry weight of vinca was not affected by Osmocote placement (Figure 5). The dry weight of the subirrigated vinca was significantly higher than trickle irrigated, and the trickle-irrigated soluble fertilizer was intermediate in dry weight between the trickle and subirrigated.

The most striking observation was the increase in plant size when the plants were subirrigated. The likely explanation is that plants had less water stress in the subirrigated treatment since they were irrigated daily. There was no effort to run the trickle-irrigation treatment dry, but the treatment did create a significant water stress. The message for the grower might be: If switching from trickle to subirigation, there may be a tendency for the plants to be a little bit larger with a subirrigation system.

Osmocote placement did not have a consistent effect on plant growth of subirrigated plants. It might be possible that placing Osmocote on the surface of a subirrigated pot could mean the plant would get less fertilizer and be smaller. That was the case for marigold and geranium, but not for dianthus and vinca. Perhaps a plant that has a high need for fertilizer early in the crop cycle might be affected, but in general Osmocote placement for subirrigated plants was not important.

Osmocote placement on trickle-irrigated plants had little effect as well. It might be possible that placing Osmocote in the bottom of a pot and then trickle irrigating might mean the fertilizer would be leached out rather than absorbed by the plant. Geraniums with Osmocote in the bottom of the pot were smaller than plants with Osmocote placed on the top of the pot, but the other taxa showed little response.

In summary, Osmocote can be placed on the top, middle or bottom of the pot with little difference in plant growth. It does not matter whether the plants are irrigated by subirrigation or trickle irrigation; the growth response to Osmocote placement was similar.

To view figures and photos, please refer to your April 2008 issue of GrowerTalks magazine.

E. Jay Holcomb is professor, Robert Berghage is associate professor, and Kathy Shumac is a technician, Department of Horticulture, Penn State University, University Park, Pennsylvania.