Relationship between Irrigation and Leaching of Nutrients in Container Production

Drs. Sheryl Wells and Matthew Chappell

Water conservation and water quality are growing concerns in container nursery production due to the increasing importance of reducing non-point source pollution. Contaminated runoff the subsequent reduction in ground water quality due to leaching is a major issue facing the nursery industry nationally. Nutrient leaching, most notably nitrogen and phosphorous, from applied nitrogen and phosphorous N and/or P fertilizer sources can have a negative effect on the environment and profitability. Leaching can be attributed to inefficient irrigation practices. Efficient irrigation has many benefits, some of which have been quantified in previous Center for Applied Nursery Research (CANR) studies (van Iersel and Chappell, 2008). With an understanding of methods that can increase irrigation efficiency, a logical next step is to implement these irrigation technologies and techniques to increase the efficiency of fertilizer applied to container nursery crops. With increasing fertilizer costs, growers are very interested in the ability to reduce the quantity of controlled release fertilizers needed to finish a crop. The simplest method of doing this is to reduce leachate volume, with the understanding that nutrients are removed from the growing media (substrate) during each leaching event. The objectives of this study are to evaluate nutrient leaching after the use of 2 controlled release fertilizers with 4 irrigation treatments on container plants.

Trials were initiated on sixty-four *Hydrangea macrophylla* 'Midnight Dutchess' and sixty-four *Gardenia augusta* 'August Beauty'™ were transplanted from standard 2.5" liner cells into full 2 gallon containers containing a soilless, composted pine bark based substrate. The substrate in 32 of the containers was mixed with 15 lb/yd^3 Osmocote Plus 19-5-8 and the substrate in 32 containers was mixed with 21 lb/yd^3 Florikan Nutricote 18-6-5. Dolomitic limestone 6.25 lb/yd^3 was mixed with substrate prior to planting. Plants were arranged in a poly house covered with a 60% shade cloth in a randomized complete block with eight replications. Within each fertilizer type, four drip irrigation treatments were applied to maintain volumetric soil moisture at 18, 15, 12 and 9% and controlled using a TDT Acclima soil moisture sensor in each replication. Volumetric soil water was controlled using an Acclima SC 6 plus irrigation controller. Irrigation volume for each treatment was measured using flow meters. Substrate electrical conductivity (EC) was measured monthly June-October using a WET-2 Sensor (Delta T, Caimbridge, U.K.). At the end of the study, plants were harvested and dried to collect a dry weight.

Surprisingly, for most treatments, the 15% volumetric soil moisture set point applied more water than the 18% treatments. Overall, less irrigation volume was applied with the 12% irrigation set point and plant dry weights were higher.

There was a steady decline in electrical conductivity (EC) with most treatments. Surprisingly, there were treatments that did not decline. The hydrangea Florikan 9% and the gardenia Osmocote 9% EC increased. We assert this increase was due to the elimination of leaching. As

nutrients were released from fertilizer prills into the soil solution, they were not flushed from the solution by a leaching event. Additionally, the plant(s) were not able to take up soluble nutrients in the soil solution as quickly as they were being release by the fertilizer prill. Ultimately, this indicates fertilizer rates were too high in a zero leaching situation and can be reduced to maintain an optimal EC in a zero leaching environment.