Redefining Irrigation Permit Allocations for Nurseries

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ABSTRACT

CIRRIG (Container IRRIGation) is a web-based irrigation control system for container nurseries. CIRRIG uses onsite weather to determine daily evapotranspiration. Evapotranspiration along with leaching fraction obtained from representative containers in the field are used to calculate the amount of irrigation to apply daily. CIRRIG was used to irrigate two trials with *Ilex cornuta* `Burfordii Nana´ and one trial with *Loropetalum chinense*. All trials were conducted in a commercial nursery in central Florida and duration of trials ranged from 106 and 139 days for *Ilex* and *Loropetalum*, respectively, to 292 days for the second *Ilex* trial. An identical zone of the same plants was irrigated based on judgement of nursery personnel. Water applied to all zones was metered and permit allocations were determined using the Agricultural Water Use Model (AGMOD) from Southwest Florida Water Management District (SWFWMD). Results indicated there should be a re-consideration of the amounts permitted for container nurseries.

OBJECTIVE

The objective of the proposed was to determine if irrigation water use data collected onsite at a container nursery was similar to AGMOD output. Permit allocations for SWFWMD are determined using AGMOD.

METHODS

Research has been conducted onsite at a container nursery (Fig. 1) using a web-based irrigation control system (CIRRIG). CIRRIG was developed at UF/IFAS based on research. CIRRIG uses onsite weather and container leaching fraction to determine daily the amount of water plants need and automatically controls the irrigation system operation times to apply the appropriate amount of water. The water use data collected for the onsite evaluations was used to determine if the amount of water applied to container plants irrigated with CIRRIG was similar to AGMOD.

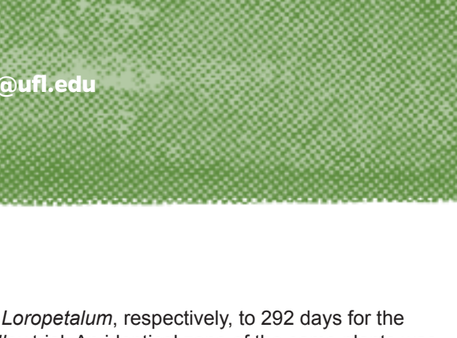

Fig. 1. Overhead sprinkler irrigation in container nursery.

Two trials with *Ilex* plants and one trial with *Loropetalum* plants grown in trade three-gallon containers were conducted in a nursery located within the geographic boundaries of SWFWMD. Plants were split into two irrigation zones, one irrigated with CIRRIG and the identical paired zone irrigated by nursery personnel using their experience and judgement. Both zones were metered to determine the amount of water applied and plants from each zone were selected for height and width measurements. In addition, a few plants in the CIRRIG zones were constantly weighed to ensure adequate substrate moisture was being maintained.

Amount of irrigation water applied, length of time each pair was evaluated (days), and amount of irrigation water per day are given in Table 1.

The amount applied for Nursery and CIRRIG were divided by number of days in the trial to obtain amount per day. AGMOD outputs inches per month for all 12 months. The amount per day for AGMOD was calculated by summing the monthly totals for AGMOD corresponding to each trial and dividing by total days for each month summed over months spanning each trial.

Table 1. Irrigation amounts per day were determined for plants grown in commercial nursery. The amounts were based on experience or judgement of nursery personnel (Nursery), Container IRRIGation web-based system (CIRRIG) developed by UF/IFAS, or Agricultural Water Use Model (AGMOD) used by Southwest Florida Water Management District.

	Irrigation			CIRRIG size effect (% of nursery)	
	Nursery	CIRRIG	AGMOD	Plant height	Plant width
	Ilex cornuta `Burfordii Nana´ (March 1 – June 15, 2016)			91	97
Irrigation amount (in)	22.9	22.0	28.4		
Days	106	106	122		
Amount per day (in)	0.216	0.208	0.233		
	Loropetalum chinense (July 5 – Nov. 21, 2016)			95	95
Irrigation amount (in)	30.2	30.0	28.5		
Days	139	139	153		
Amount per day (in)	0.217	0.216	0.186		
	Ilex cornuta `Burfordii Nana´ Aug. 10, 2017 – May 29, 2018			130	123
Irrigation amount (in)	42.7	57.4	48.2		
Days	292	292	304		
Amount per day (in)	0.146	0.197	0.158		
		Summary for all trials			
Irrigation amount (in)	95.8	109.4	105.1		
Days	537	537	579		
Amount per day (in)	0.178	0.204	0.182		
Amount per year (in)	65.1	74.4	66.3		

RESULTS

For the first *Ilex* trial and *Loropetalum* trial, the amounts per day were similar (≈0.216 inch) for Nursery and CIRRIG. The AGMOD amount for first trial of *Ilex* (0.233 inch) exceeded the amount of Nursery and CIRRIG; however, the AGMOD amount for *Loropetalum* (0.186 inch) was less than daily amount for Nursery or CIRRIG.

The second *Ilex* trial was the longest (292 days) and started with containers touching for 248 days. The amount of irrigation water for Nursery was inadequate as exhibited by decreased plant height and width. Approximately 30% more height occurred with CIRRIG. However, more irrigation water was applied (0.197 inch/day) with CIRRIG than given for AGMOD (0.158 inch/day). The 0.197 inch/day is lower than 0.208 inch/day obtained for first trial, but the plants in first trial were spaced and that can impact water use.

These data indicate that in two of three trials, daily irrigation amounts applied with CIRRIG exceeded AGMOD amounts. It should be noted that AGMOD outputs an amount per month. The start and finish time of trials or which months are included within a trial can impact the total amount and hence daily amount determined by averaging over the months included in the trial. The average for 12 months based on AGMOD output is 0.172 inch/day (62.9 inches).

CONCLUSION

The summary of data from the three CIRRIG trials conducted in a commercial nursery revealed that 74.4 inches per year would be applied with overhead sprinkler irrigation; however, AGMOD calculations averaged 66.3 inches for the trials. Based on these data, there should be a re-consideration of the amounts permitted for container nurseries. Further evaluations will be conducted so additional data can be considered.