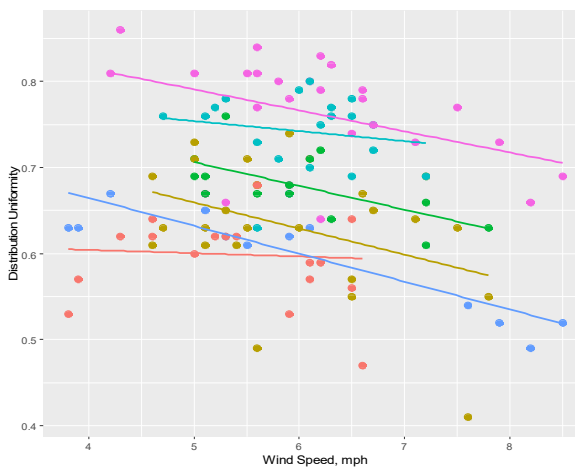


Nursery sprinkler head efficiency comparison

Materials and Methods

We tested the performance of sprinkler heads for outdoor container nurseries. We tested: Hunter PGP Ultra with 4 gpm nozzle (at 45 psi); Senninger Xcel Wobblers with 5/32 inch nozzle (4.26 gpm at 25 psi) with 25 psi pressure regulator; Nelson R2000LP with gold nozzle and gold plate (3.2 gpm at 30 psi) with 30 psi pressure regulator; Hunter MP3000 with grey nozzle (3.64 gpm at 40 psi) with 40 psi pressure regulator; Rainbird LF2400 with maroon deflector and silver nozzle (3.27 gpm at 30 psi) with 30 psi pressure regulator. The sprinklers were on 24 inch risers with diameter 3/4 inch, spaced 30 ft by 30 ft with square pattern. Hunter PGP Ultra and Senninger Xcel Wobblers were tested at an outdoor commercial nursery irrigating 6-inch containers. Senninger Xcel Wobblers, Nelson R2000LP, Hunter MP3000 and Rainbird LF2400 were tested at the South Coast Research and Extension Center in Irvine, CA.

We measured distribution uniformity of the low quarter (DU) by collecting water with a catch-can experiment by placing a grid of 6x6 of 1-gal buckets between four sprinkler heads. Water volume in the buckets was measured with graduated cylinders and wind speed with a MetOne 014A anemometer. Data were collected from all instruments with a Campbell Scientific CR1000X datalogger. Pressure in the irrigation system was measured with a hand-held pressure gauge Dwyer DPGWB-08. Application rate was calculated by dividing the average volume collected in the buckets by the area of the bucket mouth. Linear regression analysis was performed with R statistical package.



sprink
● Hunter MP3000 ● Rainbird 2045PJ ● Rainbird LF2400
● Nelson R2000LP ● Rainbird 5000Plus ● Senninger Xcel Wobblers



Results

The results obtained at the commercial nursery show that Senninger sprinklers produced a higher DU at any given pressure compared to the Hunter PGP. The Hunter PGP Ultra sprinklers showed DU as low as 0.35, that was associated with low pressures and high wind speeds (8.4 and 9 mph). However, when the pressure was 40 psi and the wind speed lower than 4 mph, the PGPs produced a DU as high as 0.7. Senninger sprinklers performance seemed less sensitive to winds speed. The results obtained at the South Coast REC showed DU ranging from 0.66 to 0.86 for the Senninger sprinklers that performed better than the Nelson (DU from 0.49 to 0.68), Hunter MP3000 (DU from 0.47 to 0.71) and the Rainbird (DU from 0.49 to 0.67) sprinklers. All sprinklers showed a lower DU associated with higher wind speeds that ranged between 3.9 and 8.5 mph. St

Linear regression statistical analysis of Distribution Uniformity Vs Wind Speed

#	Manufacturer	Model	Statistic	Estimate	p-value
1	Hunter	MP3000	Intercept	0.602	0.00001
2	Hunter	MP3000	Slope	-0.00171	NS
3	Nelson	R2000LP	Intercept	0.844	0.00001
4	Nelson	R2000LP	Slope	-0.0351	0.05
5	Rainbird	2045PJ	Intercept	0.827	0.00001
6	Rainbird	2045PJ	Slope	-0.0234	NS
7	Rainbird	LF2400	Intercept	0.794	0.00001
8	Rainbird	LF2400	Slope	-0.0324	0.0001
9	Senninger	Wobblers	Intercept	0.907	0.0001
10	Senninger	Wobblers	Slope	-0.0243	0.05

Sprinkler head		5/21/2022					
Run	DU	Pressure ^a , psi	Application rate, in/hr	Block flow rate, gpm	Wind speed, mph		
Senninger Xcel Wobblers	1	0.77	44	0.35		5.6	
	2	0.81	47	0.37		5.5	
	3	0.81	48	0.38		5.4	
Overall	0.87	46.3	0.37		5.6		
Nelson R2000LP	1	0.68	47.5	0.33		5.5	
	2	0.68	50	0.22		5.5	
	3	0.68	51	0.24		5.4	
Overall	0.71	49.5	0.21		5.4		

Sprinkler head		5/1/2022					
Run	DU	Pressure ^a , psi	Application rate, in/hr	Block flow rate, gpm	Wind speed, mph		
Hunter MP3000	1	0.55	55	0.22		3.9	
	2	0.57	55	0.33		3.9	
	3	0.53	53	0.32		5.9	
Overall	0.57	48	0.33		5.1		
Rainbird LF2400	1	0.63	59	0.3		3.8	
	2	0.63	57	0.31		3.9	
	3	0.67	57	0.31		5.9	
Overall	0.63	57.8	0.31		4.9		

Sprinkler head		5/3/2022					
Run	DU	Pressure ^a , psi	Application rate, in/hr	Block flow rate, gpm	Wind speed, mph		
Senninger Xcel Wobblers	1	0.67	49	0.26		5.1	
	2	0.68	55	0.37		5.9	
	3	0.66	54	0.37		5.9	
Overall	0.66	53.0	0.36		5.6		
Rainbird 2045PJ	1	0.67	52	0.27		5.1	
	2	0.67	58	0.27		5.9	
	3	0.76	57	0.26		5.1	
Overall	0.72	57	0.26		5.6		

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