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Proc. Fla. State Hort. Soc. 94:36-37. 1981.

A COMPARISON OF LOW VOLUME SPRINKLERS

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Abstract. **The most common sizes of 9 different kinds of low volume sprinklers were tested for coverage. Manufacturers' claims were used for gallons per hour (G.P.H.). The column in the chart showing square footage covered has the best figures to enable comparison. The last column is a price comparison.**

It was found that manufacturers' coverage figures varied considerably from their published figures. Surprisingly, the published coverage is conservative in most cases.

Each sprinkler was tested for coverage under the same conditions. If a sprinkler varied from what was expected, several were tried to eliminate defective ones. Average diameter was a maximum found, since it is felt that wetted soil tends to equalize after a period of time. In other words, capillary attraction tends to pull water out of a real wet area into a less wet area. Uniformity of coverage wasn't figured for this reason. Square foot coverage was also figured on the maximum found. No attempt was made to allow for the dry areas found in most of these sprinklers' coverage, since it is felt that there is enough air movement most of the time to allow these areas to get coverage. Comparative cost figures are higher than you will pay anywhere. They are all computed on an equal percentage basis from dealer cost. No attempt has been made to compare quality and life expectancy since most of these products are too new to determine these facts. However, you need to be aware that some of them are not very uniform and have not been holding up in the field. All sprinklers were tested at 25 lb. since we have found this to be the optimum.

Results and Discussion

Any system run at low pressure is likely to have clogging problems. This has been the main problem we are called on to diagnose. Most people think the pressure on the gauge is their system pressure when, in fact, the system pressure is sometimes quite a bit lower. The filter and mainline can lose quite a bit of pressure. Any system, including artesian-well systems, ditch systems, lake-water systems should be run at 25 lb. If this can't be done, the system should be valved so that it can be run at higher pressures occasionally. The velocity of the water going through the sprinkler orifice tends to clean them out. The filtering system is extremely important with these systems. We have found almost as many problems due to the wrong type filters as to low pressure. We have never seen a properly designed low-volume sprinkler system which requires chlorination. Any pressure higher than 25 lb. is likely to cause fogging and leakage problems.

Starting in alphabetical order with the Bowsmith, we have a two-piece jet with 11 streams of water, good coverage and the best cost figure of the two-piece jets at 40¢.

The Dan Mamtiron has a spinner which gives it good coverage, but since it works best on a stake attached with spaghetti tubing, cost is high at $1.74. Maintenance is high because of the moving parts.

The Ein-Tal does not cover much area, although it should be excellent for young trees if wind isn't a problem.

Table 1. A comparison of nine kinds of sprinklers.

25# Pressure

Sprinkler	Color or Size	G.P.H.	Average Diameter	Sq. Foot Coverage	List Cost
Bowsmith	.40	12	15 ft[z]	177	$ .40
	.50	19	19 ft[z]	284	.40
	.60	27	22 ft[z]	380	.40
Dan Mamtiron	Purple	9	16 ft	201	1.74
	Red	19	20 ft	314	1.74
	Green	27	22 ft	380	1.74
Ein-Tal	35	8	6 ft	28	.45
	70	16	11 ft	95	.45
	105	24	13 ft	133	.45
Georjet	Blue	11	8x12[y]	96	.28
	Green	17	11x18[y]	198	.28
	Red	25	14x20[y]	280	.28
360° Microjet	Blue	11	16 ft[z]	201	.45
	Green	17	20 ft[z]	314	.45
	Red	26	24 ft[z]	452	.45
1-Piece Microjet	Blue	11	8x12[y]	96	.26
	Green	17	9x13[y]	117	.26
	Red	26	11x16[y]	176	.26
Nu-Jet	Blue	11	10x13[y]	130	.26
	Green	17	12x16[y]	192	.26
	Red	26	13x20[y]	260	.26
Ris Micro-Sprinkler	Black	9	20 ft	314	1.74
	White	16	22 ft	380	1.74
	Green	19	24 ft	452	1.74
	Orange	23	25 ft	491	1.74
Ris Teal	Blue	12	16 ft[z]	201	.45
	Black	19	20 ft[z]	314	.45

[z]These jets have a number of streams with dry areas between.
[y]These jets have rectangular patterns.

It does not have the ant problem since the top drops down when not in use.

The green and red Georjets are one-piece jets with fair coverage, but would require two per tree to equal the coverage of two-piece jets. The blue Georjet covers only 96 square feet. Cost is 28¢.

The 360° Microjet is a two-piece jet with 12 streams of water and the best coverage of the two-piece jets at a cost of 45¢

The one-piece Microjet is one of the lowest cost jets available at 26¢, but would require two or three per tree to equal the two-piece jets.

The Nu-Jet is a one-piece jet with fair coverage at the lowest cost of 26¢, but, again, would require two per tree to equal the two-piece jets.

The RIS Microsprinkler has a spinner which gives it the best coverage of all, but at higher maintenance and higher cost.

The RIS Teal jet is a two-piece jet with 15 streams of water and good coverage at 45¢. The maintenance could be a little higher on it, however, since the bottom part is plug-in and has to be pulled out of the poly to clean it.

A couple of new low-volume sprinklers from Israel show some real promise with much better diameters than those on the chart. However, they have several moving parts and are much higher in cost. One is a NAAN Turbo-Hammer and the other is a water motorsprinkler from DAN with pressure regulator built in.

In closing, some speculation about the reason for the cold protection experienced by growers with low-volume sprinkler systems. It doesn't seem to have been discussed adequately before. One pound of water releases 1 BTU for each 1°F drop in temperature. Well water at 68°F down to 32°F equals 36 BTU's. That same pound of water at the point of freezing releases another 144 BTU's (1). An average low-volume system at 20 gpm per acre would release 1,728,000 BTU's per hour if all the water freezes. All this energy is released under the tree canopy which should be much more effective than firepots which release 75% of their energy straight up. This moisture-laden air also keeps the energy from radiating out of the ground as fast as it normally would both under the tree and out in the grove. A low ground fog is evident when these systems are run with little wind speed. The relative humidity is raised, thereby raising the dewpoint. It is entirely possible that too much water could be detrimental in that if a large percentage doesn't freeze, the extra 144 BTU's would not be released. The supercooling effect would be a much greater factor in this case since the moisture-laden air would have a lower temperature downwind. The worries about supercooling have not so far proven to be a factor with low-volume sprinklers if pressures are adequate. If we ever again get a severe windy freeze, the trees can only get so dead.

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Proc. Fla. State Hort. Soc. 94:37-39. 1981.

THE EFFECT OF FALL IRRIGATION ON FREEZE DAMAGE TO CITRUS[1]

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Abstract. **Trees in three irrigation experiments were examined for damage after the 1957, 1962, 1977 and 1981 freezes. Trees in the no irrigation control plots sustained more leaves and fruit drop than trees irrigated 1 to 5 weeks prior to the freezes. The data indicate that the irrigated trees were in better condition to withstand the freezes than the non-irrigated trees.**

It is generally accepted that frequent irrigation during fall and early winter tends to stimulate new growth and increase the chance of freeze injury to citrus trees. Yelenosky (6, 7) reported higher survival rate of container grown citrus seedlings and budded trees under controlled freezing condition when water was withheld. Davies, *et al.* (2) working with field grown citrus trees found that moderate water stress during the fall coupled with under-tree high volume sprinkling for cold protection can effectively reduce leaf and fruit damage during a radiation frost in which the temperature remained above 20°F (−6.7°C).

This paper reports data on leaf and fruit damage from 3 irrigation experiments following 4 major freezes between 1957 and 1981. During these experiments no attempt was made to protect the trees with heaters or irrigation during the freezes. Irrigation was applied to certain trees as dictated by previously designed irrigation treatments.

Materials and Methods

The experimental design, treatments and results of the 3 irrigation experiments have been reported elsewhere (3, 4, 5). Treatments of these experiments are described briefly again in this paper.

Experiment 1 compared irrigation vs. no irrigation on 3 orange cultivars including 'Hamlin', 'Pineapple' and 'Valencia' (Table 1). Leaf damage and fruit drop data after the December 12-13, 1957 freeze were collected. Leaf damage was visually estimated from canopy thinning 10 days after the freeze and expressed as the percent of leaves dropped. 'Pineapple' and 'Valencia' fruit that dropped on the ground were counted and boxed 6 and 8 weeks respectively after the freeze. Irrigation was applied 3 weeks before the freeze to the irrigation plots.

Experiment 2 (Table 2) consisted of 4 irrigation treatments on 'Hamlin', 'Pineapple', 'Valencia', oranges and 'Marsh' grapefruit. The irrigation treatments were as follow:

I. No irrigation control
II. Irrigation at depletion of 2/3 of readily available water (RAW) in the 0-60 inch soil depth.
III. Irrigation at depletion of 1/3 of RAW from January through June and at 2/3 depletion for

[1]Florida Agricultural Experiment Stations Journal Series No. 3428.