

Comparison of Microirrigation Systems for Almonds

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A 22-acre field demonstration was established in 1990 to evaluate the major types of microirrigation; Drip, Subsurface Drip (SDI) and Microsprinklers. This trial was designed with 36 ½ acre plots to simulate commercial conditions using four almond varieties, Nonpareil, Butte, Carmel and Monterey. The systems under study include:

1. Surface Drip - Single Hose
4 - 1 gph Netafim PC emitters/tree
2. Surface Drip - Double Hose
8 - 0.5 gph Bowsmith emitters/tree 4 ft. from rows
3. Microsprinkler
1 - 10 gph Bowsmith Fanjet between trees
4. Microsprinkler Double
2 - 5 gph Bowsmith Fanjets around trees
5. Microsprinkler Double 1.2 ET
2 - 7.5 gph Bowsmith Fanjets around trees
6. Subsurface Drip - Double Hose
8 - 0.5 gph Geoflow emitters/tree, 4 ft. from rows
7. Surface Drip Double Hose 150% Et
8 - 1 gph Netafim PC emitters at 4 ft.

8. Subsurface Drip Double New
8 - 0.5 gph PC Geoflow emitters at 4 ft.

Subsurface drip treatments were established the first year with surface hoses and early in the 2nd year converted to SDI with the tubing installed at a depth of 15 inches. Previously, Netafim Ram tubing was evaluated as SDI but became extensively plugged by almond root intrusion. All of these lines were retrofitted, spring of 2000, with pressure compensating Geoflow trifluralin impregnated SDI placed at a depth of 8-10 inches directly above the abandoned Netafim hoses. This treatment is # 8 - New Geoflow double.

Results

Data for 2001 (Table 1) show only minor yield differences between irrigation types. Statistically, micros were equal to drip and SDI across all varieties. Only when 120 % of ETc was applied via micros did yields increase over drip and SDI. This advantage is similar to past data and can also be seen in the larger kernel sizes in Butte and Carmel varieties for micros this year. (Table 2) This season we maintained equal water between

the three systems at 34 inches resulting in stressing some plots. Measurements made using a pressure bomb indicated SWP values were -8 to -12 bars for 1.0 ET trees during high evaporative periods. Part of the stress difficulty is due to the experimental design. Our test block has micros and drip plots down the same tree rows. When middles are dried for mowing etc., irrigations are delayed and drip plots often suffer more stress than micros. This problem clearly indicates one advantage to applying larger volumes of water twice per week via micros versus nearly every day or two with drip i.e. more time for cultural operations with less stress on trees

during down times. This also depends on the micro application amount/set and soil water holding capacity at the site.

New for 2001 was the installation of automated soil moisture probes in this test which have been very helpful in irrigation scheduling and monitoring differences in soil wetness between systems. Microirrigation systems can easily meet Et, but may not be favoring deep root growth nor preserving deep moisture for summer stress periods and harvest. Automated soil monitoring can warn of approaching problems.

Table 1.

System	<u>YIELDS - Lbs/Acre</u>				<u>Average</u>
	<u>Variety</u>				
	<u>Nonpareil</u>	<u>Butte</u>	<u>Carmel</u>	<u>Monterey</u>	
Drip	2,505 b	2,462	2,659	2,206	2,458
Drip Double	2,384 bc	2,315	2,520	1,950	2,292
Micros	2,538 b	2,445	2,471	2,102	2,389
Micros Double	2,670 ab	2,532	2,510	2,173	2,471
Micros Double 120%	2,896 a	2,965	2,956	2,412	2,808
Drip Double 150%	2,187 c	2,465	2,717	1,775	2,286
Subsurface Drip:					
New Geoflow Double	2,466 bc	2,359	2,494	1,689	2,252
Geoflow Double	2,574 b	2,423	2541	1,789	2332
		ns	ns		ns

Fishers Protected LSD P=0.05

ns= not significant

Table 2

<u>System</u>	<u>Kernel size gms.</u>				<u>Average</u>
	<u>Variety</u>				
	<u>Nonpareil</u>	<u>Butte</u>	<u>Carmel</u>	<u>Monterey</u>	
Drip	1.18	0.93 ab	1.16 cd	1.29	1.14
Drip Double	1.20	0.93 ab	1.17 bcd	1.36	1.17
Micros	1.19	0.95 ab	1.20 ab	1.39	1.18
Micros Double	1.26	0.95 ab	1.20 abc	1.32	1.18
Micros Double 120%	1.23	0.96 a	1.22 a	1.36	1.19
Drip Double 150%	1.26	0.96 a	1.20 ab	1.34	1.19
Subsurface Drip:					
New Geoflow Double	1.23	0.92 bc	1.16 cd	1.37	1.17
Geoflow Double	1.18	0.89 c	1.12 d	1.37	1.14

Fishers Protected LSD P=0.05

The small yield advantage micros have over drip is dependant upon the availability of more water. Given equal water, drip and micros have yielded the same in this test. Given more water, microsprinklers can outperform drip systems in yield and kernel size. Given the restricted rootzone due to a shallow clay layer in some areas at this site, applying more water via drip (treatment #7) causes soil saturation problems. Increasing irrigation to micros (#5) spreads water over a much larger area avoiding saturation. Careful understanding of site specific conditions are required when operating and evaluating any irrigation system.

Geoflow SDI plots continue to yield the same as surface drip and show no signs of root intrusion after 11 years in the field. The original Geoflow SDI emitters installed were not pressure compensating so resulted in poorer uniformity. The New Geoflow SDI product is PC. Trees switched in spring 2000

to the New Geoflow from plugged SDI hoses have responded dramatically in shoot growth and yield. This indicates how responsive almonds are to sufficient irrigation and how soon yield can begin to repay costs of irrigation improvements.

Tree anchorage problems have troubled most westside orchards prompting growers to question the anchoring strength of root systems. A rating of tree “leaners” in this test area was made this summer and found no significant difference in % leaning trees between drip and micro irrigated trees. All four varieties, Nonpareil, Butte, Carmel and Monterey on Lovell peach were rated.