Comparison of Microirrigation Systems for Almonds

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A 22 acre field demonstration site was established in 1990 to evaluate the main types of microirrigation systems: Drip, Subsurface Drip (SDI) and Microsprinklers. This site was designed for replicated evaluation of the systems while also of sufficient size for a practical field demonstration. Four almond varieties, 'Nonpareil',' Butte', 'Carmel' and 'Monterey', are being grown with each of the following irrigation systems:

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 tree row
3. Microsprinkler – 1 - 10 gph Bowsmith Fanjet per tree
4. Microsprinkler double – 2 - 5 gph Bowsmith Fanjets per tree
5. Microsprinkler double 1.2 ET – 2 - 7.5 gph Bowsmith Fanjets per tree
6. Subsurface Drip - double hose – 8 - 0.5 gph Geoflow emitters/tree, 4 ft. from tree row
7. Surface Drip double hose 150% Et – 8 - 1 gph Netafim PC emitters
8. Subsurface Drip double New – 8 - 0.5 gph PC Geoflow emitters

Subsurface drip treatments were established the first year with surface drip systems and early in the 2nd year converted to subsurface drip with the drip 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 areas were retrofitted during the 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 2000 (Table1) show only a minor yield increase for micros over drip and SDI. Nonpareils produced about 200 lbs. more with micros. This advantage is similar to historical averages as seen in Table 2. However, this conclusion is complicated by the fact that the micro plots in some seasons, during some high water use periods, received more water than the drip plots. (30 inches drip versus 33 inches micro in 2000) Despite efforts to maintain equal water rates, completing timely mowing and spraying operations invariably resulted in under irrigating. Catch-up schedules favored the higher output micros resulting in more water applied to micro trees. Last season extraordinary efforts kept water equal between systems but at the cost of stressing many plots. Part of the difficulty is due to the experimental design. Our test block has micros and drip plots down the same tree rows. When drying down micro middles for mowing the drip trees in the same row become stressed. This problem clearly indicates one advantage to applying water twice per week via micros versus nearly every day or two with drip i.e.more time for cultural operations without stressing trees.

Table 1.

YIELDS - Lbs/Acre

System	Variety Nonpareil	Butte	Carmel	Monterey	Average
Drip	1,779 cd	1,907	1,919	2,244	1,962
Drip Double	1,915 bc	1,970	1,989	2,289	2,041
Micros	2,048 b	2,329	2,114	2,499	2,247
Micros Double	1,970 bc	2,302	2,041	2,336	2,162
Micros Double 1.2	2,367 a	2,826	2,375	2,412	2,495
Drip Double 200%	1,989 bc	1,931	1,859	2,428	2,052
SDI Double:					
Shallow New Geoflow	1,600 d	1,741	1,898	2,098	1,834
Deep Original Geoflow	1,824 bc	1,927	2,019	2,089	1,965

P = 0.05

Fishers Protected LSD

What yield advantage micros have over drip is dependant upon the availability of more water. Micro root systems are a little wider and can access more winter stored soil moisture. At equal water application amounts drip and micros have yielded about the same in this test. Where micro trees received 120% of Et (treatment #5) they outproduced all other comparisons as was found last year. Given more water, microsprinklers can outperform drip systems. Our problem here is that applying more water to the restricted rootzone of drip plots causes soil saturation problems (treatment #7), while increased irrigation to micros spreads water over a much larger area avoiding saturation. Micros have the potential to outyield drip but only if more water is applied. In some spots in the field where soil limitations prevent extra water application to drip plots both systems produce equally. Careful understanding of site specific conditions are required when evaluating any irrigation system.

Table 2.

Historical Yields

YIELDS* - Lbs./Acre

System	1994	1995	1996	1997	1998	1999	2000	Total	Average
Drip	1,050	928	2,139	2,102	2,303	2,471	1,962	12,955	1,851
Micros	1,537	939	2,404	2,208	2,470	2,310	2,247	14,115	2,016
SDI	1,234	864	2,025	1,955	2,167	2,289	1,965	12,499	1,786

*Average of all four varieties

Geoflow SDI plots continue to yield the same as surface drip and show no signs of root intrusion after 10 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 to the New Geoflow this spring from plugged SDI hoses have already responded in both appearance and yield. This indicates how responsive almonds are to sufficient irrigation and how soon yield can begin to repay costs of irrigation improvements.