

ALFALFA SEED

Underground Drip Irrigation

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Average alfalfa seed yield with each of five subsurface drip irrigation systems.

System and emitter spacing	Seed yield lbs./A
Chapin continuous	1779 a*
Chapin 8-inch	1086 ab
Nelco 24-inch	831 ab
Watersaver 24-inch	661 b
Anjac 36-inch	543 b

* Differences not significant at $P = 0.05$, as determined by Duncan's multiple range test, if followed by the same letter.

Five underground drip irrigation systems with varied emitter spacings were evaluated for alfalfa seed production in the Imperial Valley. Previously, higher seed yields had been produced with a 50-centibar soil water tension at 9 inches below surface drip lines than with soil water tensions of 10, 100, and 200 centibars (see *California Agriculture*, November 1975). Since surface drip lines are subject to sunlight and mechanical damage, we began an evaluation of five underground drip irrigation systems for alfalfa seed production in November 1973 at the Imperial Valley Conservation Research Center near Brawley. The five systems with indicated emitter spacings were: (1) Chapin, continuous (a biwall system with orifices spaced 32 inches on the inside tube and water seeping through a nylon-sewn seam on the outside tube); (2) Chapin, 8"; (3) Watersaver, 24"; (4) Nelco, 24"; and (5) Anjac, 36". The main objective was to determine the effect of emitter spacings on alfalfa seed yield rather than to compare commercially available drip lines.

A single 100-foot line of each system was installed 6 inches below the surface in the center of 15-inch-wide beds at a 40-inch spacing. The drip systems

were placed in alternate beds planted with double rows, at a 12-inch spacing, of cultivar Moapa 69 alfalfa. The remaining beds were not planted. Enough water was applied daily to maintain an ideal soil water tension of about 50 centibars at the 9-inch depth in the plant row during the seed production period between May 15 and August 15, 1974. The soil water tension was maintained at 10 to 30 centibars during the remainder of the year. The alfalfa was thinned to a 3-inch plant spacing in the rows. Insecticides for control of lygus and other insects were applied as needed. For yield data analysis the test lines were divided into four 20-foot sections with 10-foot borders at each end.

The plots were harvested on August 30, 1974. Cleaned seed yields were highly variable as indicated by the large yield differences required for significance at the 5 percent level (see table). Low yields in Chapin 8", Nelco 24", and Watersaver 24" were caused primarily by plugged emitters at the distal ends of the lines. Plants wilted, decreased in growth rate, and died. The wide emitter spacing was apparently the main cause for low yield with the Anjac 36" because the alfalfa grew and yielded well near the emitters but poorly midway between the emitters.

On November 14, 1974 all systems were checked for causes for malfunction. The distal end of each line was opened and the water turned on. Each line flowed well, indicating no restriction or plugging of lines, although a small quantity of sediment flowed out. Parts of each test line were removed from areas of malfunction and the emitters and soil surrounding the lines were inspected. Roots were concentrated around emitters and along areas of discharge but had not

entered the emitters or lines. In places where the alfalfa had died, fine roots were concentrated in the flap (Watersaver and Chapin) or near emitters. Such concentration was considered to be a result rather than a cause of diminished water flow through the emitters, since roots were not concentrated near emitters where plants were healthy. The emitters were plugged with a material that had built up inside the lines on the end. The material appeared to be a finely crystalline structure covered with a slime, but was not further analyzed. An injection of phosphoric acid into the system in May 1974 may have contributed to the sediment formation and plugging of the emitters. Periodic flushing of the system might prevent plugging of the emitters.

Conclusions

Highest yield, 1779 pounds of Moapa 69 seed per acre, was produced with the continuous emitter spacing. Yields were 1086 and 831 pounds per acre on the 8" and one of the 24" spacings, respectively. Differences between the three highest yields were not statistically significant because of high plot variability and the small number of replicates. The 36-inch spacing was too wide to produce high yields.

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