Yield Uniformity of Cotton Irrigated with Drip Irrigation

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Yield increases of cotton reported with drip irrigation systems may be due to increased plant performance and/or increased uniformity of plant growth within a field. Improved uniformity in drip irrigated fields results from the timely, even distribution of water and nutrients through the system. Hydraulics of water flow in the drip lines results in slightly more water applied to the top of the field than the bottom. When applied water is near the consumptive use of the cotton plant, small water differences may significantly influence yields. To evaluate the influence of the near consumptive use applications of water and the small differences in distribution of water and nutrients down drip lines, yields were collected in sequential 30 foot intervals down the rows of two drip irrigated fields. A Delta and Pine Land spindle picker was used to harvest cotton in two fields. One was irrigated with an above ground drip system and the other was irrigated with a below ground system. Both were located on Sundance (formerly M&W) Farm near Casa Grande.

Seed cotton weights were collected in the field and subsamples were ginned to determine turnout. Results of yields and turnouts for different varieties are given in Table 1 for the below ground system and Table 2 for the above ground system.

Table 1. Seed cotton yields, turnouts, and lint yields for different varieties irrigated with a below ground irrigation system, first pick only.

	Variety (D&PL)				
	41	70	733	62	90
Lb seed cotton/acre	4976	4246	4557	3837	4950
Turnout	0.360	0.361	0.338	0.338	0.343
Lb lint/acre	1791	1532	1540	1297	1698
480 lb bales/acre	3.7	3.2	3.2	2.7	3.5

Table 2. Seed cotton yields, turnout, and lint yields for different varieties irrigated with an above ground irrigation system, first pick only.

	41	70	62	90	30	7613	SJ2
Lb seed cotton/acre	5311	4811	3818	5737	4716	4239	4169
Turnout	0.359	0.343	0.344	0.347	0.343	0.363	0.296
Lb lint/acre	1901	1650	1314	1991	1618	1539	1234
480 lb bales/acre	4.0	3.4	2.7	4.1	3.4	3.2	2.6

Standard deviations and coefficients of variation were determined to compare yield uniformity. Linear regression analysis was run to determine if a yield trend could be found down cotton rows.

Results of statical analysis are given in Table 3.

Table 3. Standard deviation, coefficient of variation and slope of first pick cotton yields collected sequentially down drip rows.

Irrigation* Method	Variety	Standard Deviation	Coefficient of variation	Slope	Mean Plot Weight
B	41	1.49	6.72	-0.14	22.2
B	70	2.36	12.36	-0.12	19.1
B	733	1.55	7.70	-0.14	20.1
B	62	1.26	7.52	-0.02	16.7
B	90	1.76	7.92	0.09	22.2
A	41	3.16	12.93	0.10	24.4
A	70	4.71	20.47	-0.11	23.0
A	62	2.01	11.80	0.21	17.0
A	90	1.63	6.23	0.11	26.1
A	30	3.51	16.73	-0.41	21.0
A	7613	4.58	24.20	-0.12	18.9
A	SJ2	1.69	8.71	-0.11	19.4

* A = above ground drip
B = below ground drip

Although a number of negative slopes (meaning more yield at the top of the field than at the bottom) were obtained, the slopes are very small and probably not significant (no real difference in yield at top and bottom). There is apparently no affect of the slight non-uniform water application in these drip systems. Comparing coefficient of variations and yields between the two systems indicates that yields in the field irrigated with the below ground system were more uniform but were slightly lower than yields the field irrigated with the above ground system. In this case, improved uniformity did not result in higher yields.

NITROGEN FERTILITY AND SOIL SALINITY IN DRIP IRRIGATED COTTON

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Summary

Drip irrigation changes not only water application to a crop but many other aspects of crop management. The frequent, uniform, and efficient application of water provides a very effective vehicle for application of Nitrogen (N) and for salinity management. Efficient water application results in reduced leaching which may result in salt build-up within the soil. Soil salinities were measured at the end of the 1982 growing season and were found to be well withincotton tolerances throughout the soil profile with little accumulation in both one- and two-year old production fields. Nitrogen application, petiole nitrate-nitrogen, and flowering characteristics from two differently managed drip irrigated production cotton fields are reported.

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Drip irrigation of cotton, with its frequent water applications, provides the opporunity for substantial improvements in nitrogen management. The highly efficient application of water at point or line sources also provides water movement patterns which can provide good salinity control during a season but may result in substantial salt accumulations in the upper soil profile over several seasons. There is currently considerable interest in the use of drip irrigation systems and the potential impact of improved water,nitrogen and salt management is of equal interest. Two different production scale systems were monitored in 1982 on the farm of Howard Wuertz approximately 60 miles south of Phoenix. Both systems were functionally the same except for the drip line itself. In one system the drip line was buried six to eight inches below the soil surface, one line under each cotton row. Emitters were 12 inches apart. The second system had the drip line layed on the soil surface, one line for each two rows. Emitters in the above-ground system were 40 inches apart. Daily flower counts were