Table 2. Water applied and lint yield obtained by spray irrigation in Field E-2, Marana Farm 1981.

	Water Applied inches*	First Pick bales/ac	Second Pick bales/ac	Total Yield bales/ac
North half	27.28	2.30	0.13	2.43
South half	30.46	2.47	0.20	2.67

* 9.18 inches of rainfall occurred during the season and is not included in the water applied.

The results for both fields show good yields for the water delivered. Why more water was applied to E-2 than E-1 is not known. Soil moisture data were collected and preliminary analyses show E-2 was drier than E-1 much of the season. The water meter used for E-1 has been calibrated and found to be correct. The water meter used for E-2 will be checked.

These systems have the advantages of being able to apply water uniformly and at an amount and frequency which meet crop needs. They offer some of the advantages of trickle irrigation without the disadvantages of having tubing spread over the field.

An important disadvantage is the need for furrow checks to hold the water where it is applied. Machinery to install the checks is not commerically available but can be easily constructed. Check erosion occurred with the furrow drops. This can be controlled by installing a proper energy dissipation device at the end of the drop tube. Because our checks were small, the cotton was picked without removing the checks. There are several possibilities for check management. First, checks can be placed in alternate furrows so there are no checks where the main picker wheels travel. Second, it is possible to add a nozzle to the furrow drops to erode the checks during the last irrigation. Third, a small shovel could be mounted on the picker to remove the top of the checks.

Irrigation Strategy for Short-Season Cotton Production

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Summary

Data were examined from 5 years of irrigation tests. Delaying the first irrigation did not increase the number of fruiting sites produced, but sometimes increased early flowering rate. Decreased lygus bug activitiy and decreased square shedding were associated with increased early flowering. Water deficit that continued during the flowering stage decreased boll retention early in the season, decreased the production of fruiting sites, and decreased the number of flowers produced. A mild stress decreased yield primarily by decreasing boll retention, whereas a more severe stress greatly decreased the number of flowers produced. For maximum yields, especially in a short-season system, we conclude that water deficits should not be permitted from the time of first flower until the producer is ready to terminate the crop.

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Interest in short-season cotton culture is increasing because of a desire to avoid the problems of late-season insect pests and a need to conserve irrigation water. In some cases a winter crop can be grown on the same land.

Earliness, expressed as a percentage of the crop in the first picking, is sometimes increased by a water deficit. Water management has been used for years as a technique for limiting plant growth. Therefore, it might seem logical that limited irrigation would be suitable for a short-season program.

We examined data from 5 years of irrigation tests (1977-1981). During those years various irrigation treatments were imposed. During 1978, 1979, and 1980 the first post-emergence irrigation was delayed in some treatments. During 1977, 1978, and 1981 less than optimum amounts of water were supplied during the flowering period to some of the treatments. We counted and tagged blooms daily. At the end of the season we determined the numbers of flowers produced daily, the percentage of flowers that matured into bolls (boll retention), and the cumulative numbers of flowers during the season that produced bolls (total bolls set by given dates).

Some workers have reported that stress increases flowering rate in cotton. Our results indicate that stress which continues actually decreased the number of fruiting sites produced. We did find that delaying the first irrigation increased the flowering rate during the first two weeks of flowering in 1979 and 1980. We also found that the stressed plots contained fewer lygus bugs than the irrigated plots. Therefore, we suspect that the difference in early flowering was caused by a difference in number of squares that shed because of insect injury. Square shedding was surprisingly low before flowering started in plots where the first irrigation was delayed.

Stress during flowering decreased the percentage of bolls retained (increased boll shedding) compared with the normally irrigated plants (Fig. 1). However, boll retention rate gradually decreased on the normally irrigated (control) plants as their boll load increased, probably because of competition for nutrients by the developing bolls. Therefore, boll retention rates (as a percentage of flowers produced) became low and about equal in stressed and control plants as they approached cutout. Severe stress decreased the number of blooms produced. To estimate the relative effects of decreased bloom production and decreased boll retention we tabulated the results from 3 years of data in Table 1. The results indicate that a mild stress (1981) decreased yield primarily by decreasig boll retention, whereas a severe stress (1977) caused a severe reduction in the number of blooms produced. The resulting decrease in boll load probably decreased competition. Because of this reduction in competition, boll retention rate was not decreased as much as might have been expected. (Boll shedding is affected by water stress and by boll load.)

Because stress decreased boll retention and flowering rate it decreased the rate at which plants set bolls, and stress caused a more nearly complete cutout than occurred with control plants. Plots of cumulative numbers of bolls set by different dates indicated that yield was decreased by stress regardless of duration of the fruiting season. In 1981, stressed plants resumed growth and fruiting late in the season and made up some of the difference (Fig. 2).

Our results indicate that, for maximum yields, plants should not be stressed from the start of flowering until the producer is ready to terminate the crop.

Table 1. Relative decreases in numbers of blooms produced, bolls retained, and total bolls produced arranged in order of severity of yield reduction due to water deficit. Data are expressed as percentages of the normally irrigated control plots for each year.

	Year					
	1981	1981	1978	1978	1977	1977
Decrease in:	%	%	%	%	%	%
Blooms	0	7	18	27	24	33
Boll retention rate	14	11	1	5	9	14
Total bolls produced	14	18	19	32	33	47

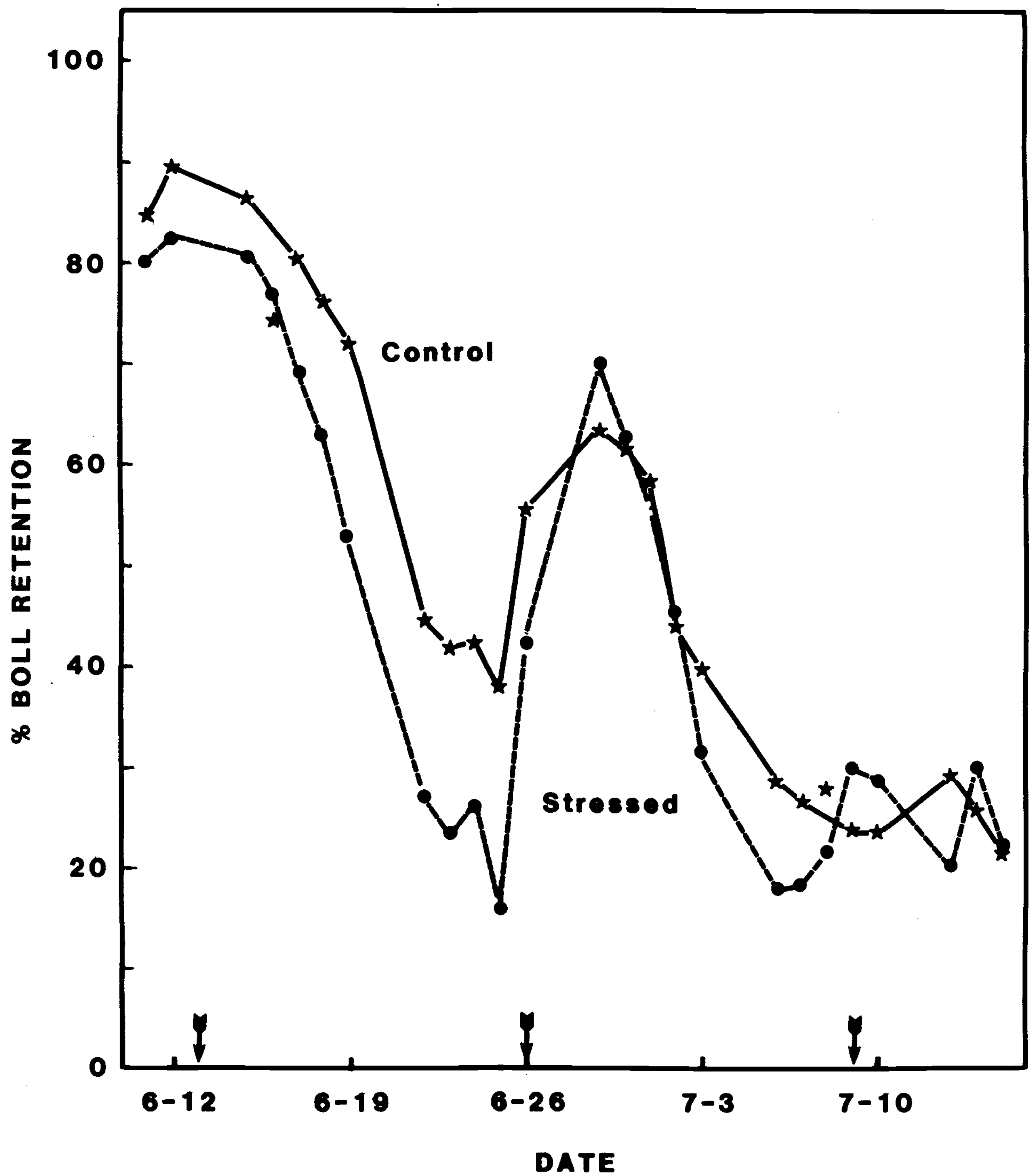

Figure 1. Percentage of blooms that matured ~~a~~ bolls at different times in 1981 as influenced by a mild water deficit. Arrows indicate irrigation.

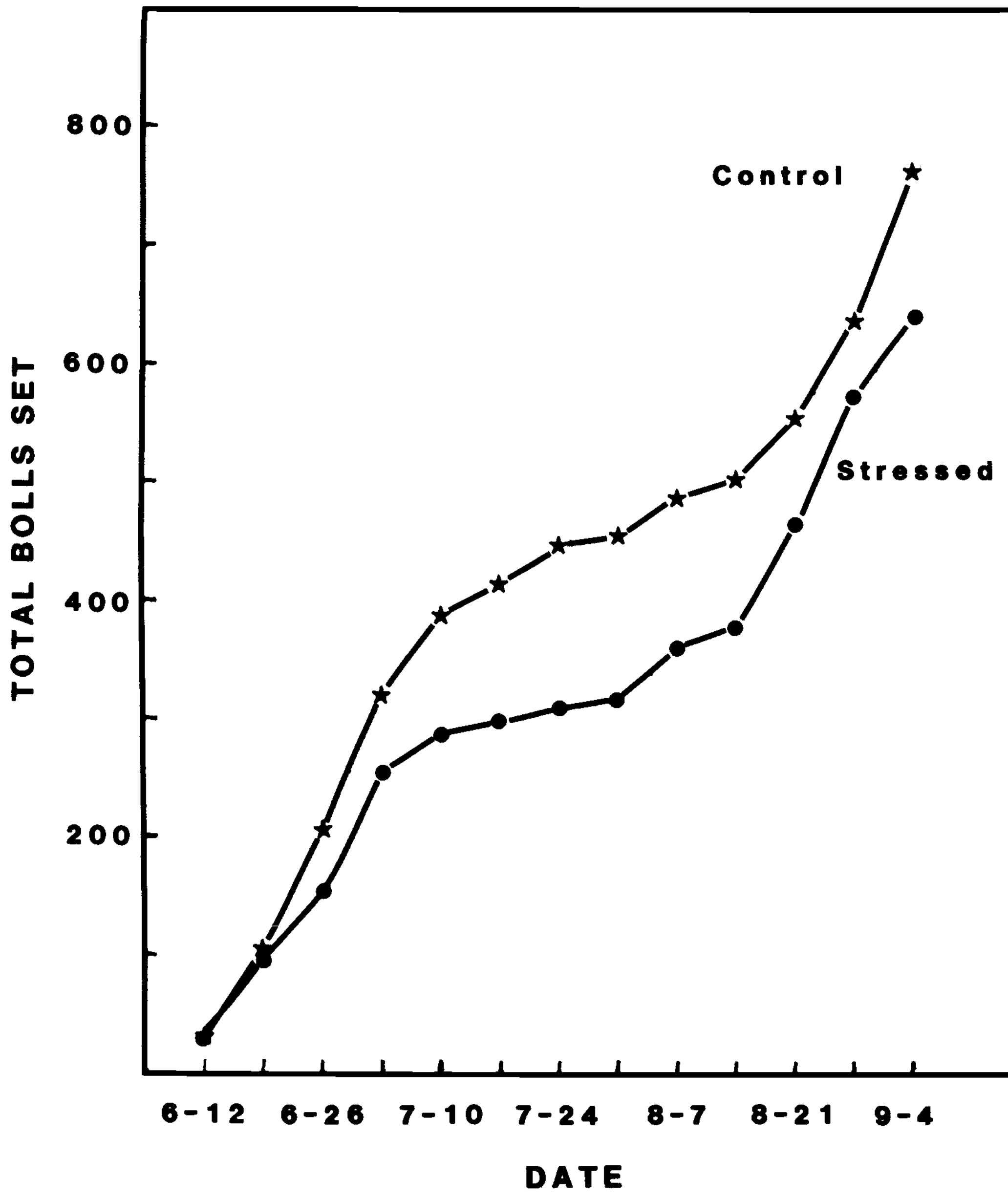

Figure 1. Cumulative numbers of bolls set by different times in 1981 as influenced by a mild water deficit (4" versus 6" every 2 weeks).