# DRYLAND COTTON TOLERATED MITES BETTER THAN IRRIGATED COTTON

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## SUMMARY

We compared the responses of dryland and irrigated cotton to damage caused by two-spotted spider mites in a field experiment at Narrabri. Mites colonies developed at similar rates in irrigated and dryland crops. Despite the similar intensity of infestation, visual symptoms of mite injury were more marked on irrigated plants than on their dryland counterparts. Lint yield of unstressed controls (irrigated, no mites) was 7.8 bales per ha. Water deficit alone reduced yield by 30%. Mites reduced yield more in irrigated (92%) than in dryland crops (72%). Under our experimental conditions, mechanisms of adjustment to water deficit may have enhanced cotton resistance to mites.

## Introduction

Limited water availability and yield losses due to pests are the two main constraints for cotton production in Australia. The two-spotted spider mite, the main secondary pest of cotton, has the potential to reduce both yield and quality. Most of the current practices aimed at the control of mites in Australian cotton farms are based upon the basic research carried out in irrigated crops (Wilson, 1993). Much less is known about the responses of dryland crops to mites. We don't know, for instance, if dryland crops are more, equally or less sensitive to mites than irrigated crops. To address this question we compared the physiological and yield responses of cotton to mites in dryland and irrigated crops.

## Methods

A field experiment was carried out at the ACRI in a crop of NuCotn 37 sown on October 9, 1996. Insect pests, other than mites, were monitored twice weekly and controlled with insecticide when necessary. Plant density was 13 plants per m and crops were fertilized with 100 kg N/ha before sowing.

Four treatments were compared

-M-W: no mites, dryland
-M+W: no mites, irrigated
+M-W: mite-infested, dryland
+M+W: mite-infested, irrigated

All crops were furrow irrigated before sowing. Thereafter +W crops were irrigated each time a soil water deficit of 50-60 mm was reached while -W crops received no further irrigation. To reduce rainfall infiltration, the soil between rows in -W plots was covered with transparent polyethylene film. +M plots were artificially infested with mites 83 days after sowing (late December) while -M plots were kept almost free of mites using chemical control as required.

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We measured cotton yield, soil water content, selected physiological variables and also assessed mite populations and tested their preference for leaf tissue from dryland or irrigated crops.

## Results and Discussion

In comparison with unstressed host plants, the abundance of mites in water-stressed hosts can increase, decrease or remain unchanged, depending on the intensity of water deficit (English-Loeb 1989, 1990). In our experiment, mite colonies developed equally well in dryland and irrigated crops (Fig. 1A). Despite the similarity in number of mites, the proportion of leaf area with visual symptoms of damage was greater in leaves of irrigated plants than in leaves of dryland ones (Fig. 1B). Particularly note that the area of leaf showing severe damage symptoms was far higher on irrigated cotton than on dryland cotton (Fig. 1C).

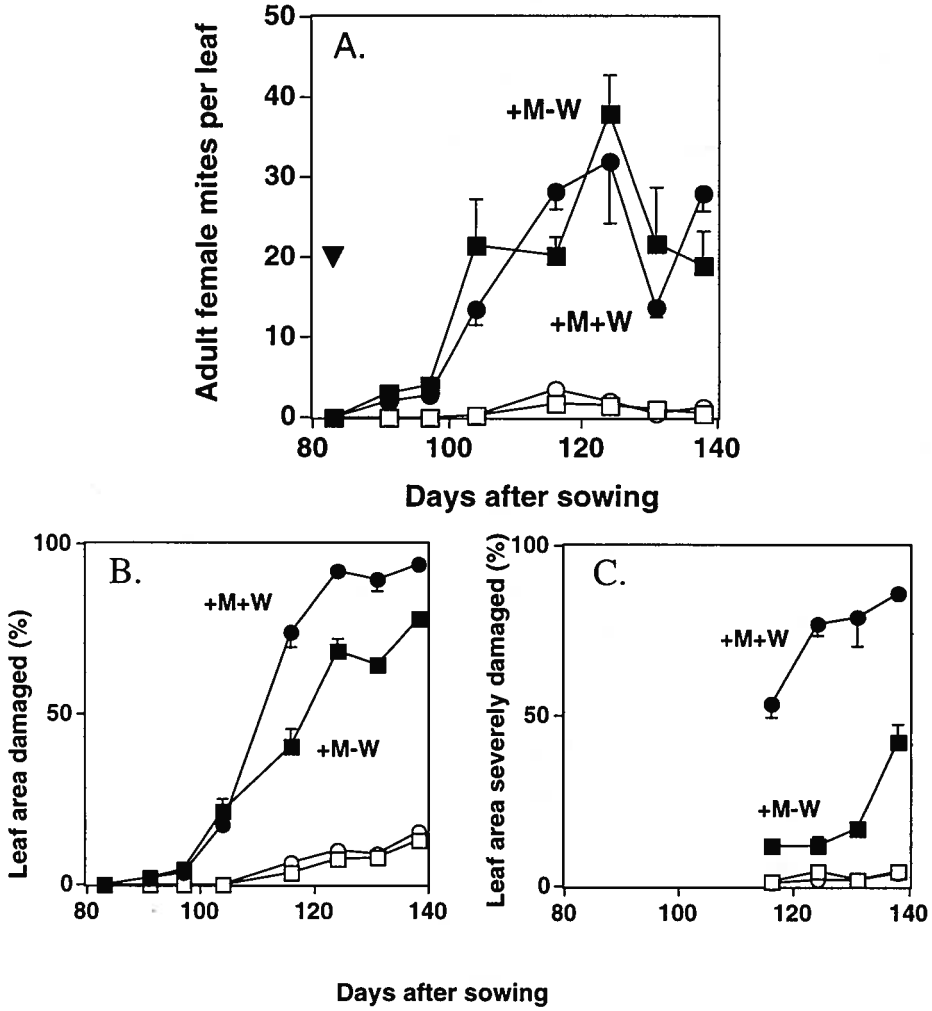


**Fig. 1**. (A) Number of adult female mites as a function of time and treatments; the arrow indicates the time of artificial infestation, (B) the percentage of leaf area with visual symptoms of damage from mite feeding and (C) percentage of leaf area with severe mite damage. Error bars are one standard error of the mean. Circles are irrigated, squares are dryland, closed symbols are mite infested and open symbols are uninfested.

In a choice test, adult female mites preferred to feed and oviposit on leaves from irrigated cotton rather than on leaves from dryland crops (Table 1). This was, at least in part, because leaves from dryland crops were harder to penetrate (Sadras *et al.*, 1998).

**TABLE 1.** Mites showed a significant preference to feed and oviposit on leaves of irrigated than dryland plants. Values are means ± s.e.

| Treatment | Mite response | |
|---|---|---|
| | Number of adult females | Number of eggs |
| Irrigated (+ W) | 5·9 ± 0·57 | 48 ± 4·3 |
| Dryland (- W) | 3·9 ± 0·59 | 28 ± 3·6 |

Lint yield of uninfested irrigated crops was 7.8 bales per ha (Fig. 2). Water deficit alone reduced yield by 30%. Mites reduced yield by 92% in irrigated crops and by 72% in dryland crops.

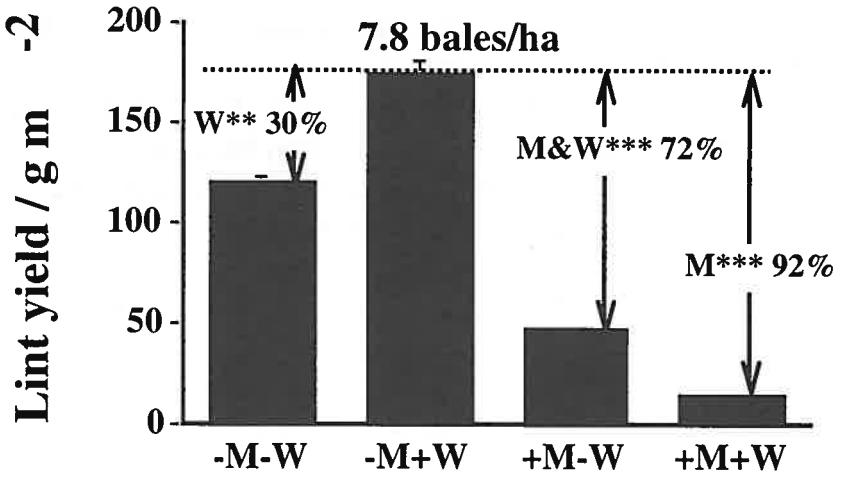


**Fig. 2.** Lint yield of cotton crops as affected by mites and water regime. + W indicates fully irrigated cotton, -W indicates water stressed cotton (dryland cotton), +M indicates mite infested cotton and -M indicates cotton with no mite infestation.

CONCLUSIONS

- Both mites and water deficit had detrimental effects on cotton growth and yield. **Under our experimental conditions**, mites caused more damage to irrigated crops than to their water-stressed counterparts, i.e. mite-infested, irrigated plants had more extended and more intense symptoms of leaf injury and lower lint yield than their water-stressed counterparts. We propose that mechanisms of adjustment to water deficit, including increasing leaf hardness, may have enhanced cotton resistance to mites.

- In our experiment yield losses due to mites were highly significant in both irrigated and dryland crops. However, the higher tolerance of dryland crops to mites deserves further investigation as it has important implications for mite thresholds in dryland situations. In particular, more work is needed to establish the responses of both mite populations and cotton crops to a wide range of intensities and timing of water deficit. If a dryland crop is growing well with adequate moisture then it is probably equal to irrigated cotton in susceptibility to mite damage. However, a water stressed dryland crop may be more tolerant of mites and if the stress occurs later in the season, when mites are less likely to affect yield, there may be no benefit in controlling the mites. This is the subject of continuing research at ACRI.

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