

Improving irrigation efficiency in a semi arid sub tropical environment c. leaf expansion and dry matter partitioning

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A third objective of the Emerald irrigation management research programme (I) is to monitor cotton response to a range of irrigation strategies in terms of plant and fruiting development. The height and canopy size of the cotton plant influences the number of potential fruiting sites and fruit setting. It can also influence disease incidence and insect control.

Methods

Dry weight of above ground leaf, stem and fruiting parts was regularly measured on one metre sections of row. Leaf area was calculated from total leaf green weight and the green weight of 2 x 20 leaf discs taken from each sample to cover a range of leaf sizes and positions.

Results and Discussion

The more frequently irrigated plants were consistently taller with more main stem nodes than the less frequently irrigated plants. The rates of leaf expansion and the peak leaf areas of each treatment were also closely related to irrigation frequency. In the 82-83 season, the bigger leaf surface of the VF treatment did not result in higher yields. In 83-84 the yields from the VF treatment were again lower than yields from the F treatment even though the leaf area and height differences between the two treatments were not as great as in 82-83. This response is presumably due to waterlogging effects as well as excessive vegetative growth.

The consistency of canopy development and yield results (I) over two seasons supports the view that a cotton grower can select an irrigation strategy which will grow the type of crop suited to his requirements. If a larger planted area and more efficient use of irrigation are selection criteria then the IF and VIF strategies should be considered. These treatments may be less attractive to insects and the more open canopies may improve the level of insect control and reduce leaf and boll diseases. If near maximum yield is the goal, strategy F should be adopted. The leaf area should be greater than $1 \text{ m}^2 \text{ m}^{-2}$ at the start of flowering and during the following 4-5 weeks irrigation should be frequent enough to maintain leaf expansion as well as produce fruit. This ensures near maximum radiation interception (leaf area $3 \text{ m}^2 \text{ m}^{-2}$) prior to peak flower.

The initial rate of boll setting is slightly faster in the IF and VIF treatments than in the F and VF treatments. At harvest bolls made up 65% of above ground biomass in IF and VIF compared with 54% in F and VF treatments. Evidence from other Emerald work and from the literature (2,3) suggests that 'relative fruitfulness' can vary by up to 10% in different nitrogen, irrigation and square removal treatments.

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