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CRC FINAL REPORT

CS30L - THE RESPONSE OF THE COTTON PLANT TO DAMAGE

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This project continued project CS16L (with the same title, started in 1985/86) and ran from 1986 to 1988.

The aims of the project were:

* to test various versions of SIRATAC on a commercial scale.

* to provide a database of the response of cotton to damage.

* to compare the response of the new varieties Siokra and DP90 with DP61.

Field work consisted of large scale trials on the leased Leitch block and small plot experiments using manual disbudding to simulated pest damage. The results of these trials were integrated with data from CS16L (The response of cotton crops to damage) and CS23L (Development Officers for SIRATAC) and made available to the industry at the Australian Cotton Conference (Kelly et al 1988). Further analysis of these results has shown that the capacity of the cotton crop to compensate for early season damage depends on the yield level. At yield levels common a decade or more ago (5 to 6 bales per ha) the crop could compensate but at current yield levels (7+ bales per ha) it is unable to do so. Furthermore Siokra is more tolerant to damage than DP90. These findings have been published in a series of three papers in the Journal of Economic Entomology (Brook et al 1992, in press) and received rave reviews from the cotton entomology community. The abstracts of these papers are attached.

Response of Cotton (*Gossypium hirsutum* L.) to Damage by Insect Pests in Australia: 1. Pest Management Trials. K. D. Brook, A.B. Hearn and C.F. Kelly.

ABSTRACT Twenty pest management experiments were done between 1985 and 1988 at 11 sites in the Namoi valley of NSW, Australia on four varieties of cotton (*Gossypium hirsutum* L.). In every experiment the control treatment, consisting of the standard action thresholds for the common insect pests of the region, was compared with higher early season thresholds. Lower thresholds were tested at one site for three seasons and at three other sites for the last season. The Australian bred okra leaf variety 'Siokra' consistently out-yielded normal leaf variety 'DP90' and required fewer sprays. Siokra with higher early season pest thresholds had yields

similar to or better than the control treatment. DP90 compensated less for early season damage and was therefore more susceptible to early season damage than Siokra, often resulting in a lower yield for the treatments with higher thresholds. There was no threshold treatment that was always the best but there was a trend for treatments with higher early season thresholds to be more profitable than the control with the Australian varieties Siokra and Sicala, but not with DP90. Higher thresholds early in the season, and the resultant less stringent pest control, did not consistently delay the crop nor lead to more late season applications of costly insecticides. The less exhaustively tested treatment with low thresholds always yielded well. It was the most profitable only one year in three with Siokra but 2 years in 3 with DP90.

Response of Cotton(*Gossypium hirsutum* L.) to Damage by Insect Pests in Australia: 2. Manual Simulation of Damage. K. D. Brook, A.B. Hearn and C.F. Kelly.

ABSTRACT Three experiments were done between 1984 and 1987 in which pest damage was manually simulated with up to 14 damage treatments in any year, involving different types and levels of damage at three stages of the season, applied to three varieties, two plant populations and two irrigation regimes. In these experiments the cotton plant has again shown a considerable ability to compensate in terms of total lint yield for early damage, involving either the loss of the growing point or squares. Although severe damage or combinations of tip and square removal sometimes caused considerable delay in maturity, light and moderate damage had little effect. The damage treatments did not affect fibre attributes sufficiently to have incurred price penalties commercially, despite extreme delay in some cases. Damage treatments did not interact with plant populations and irrigation regimes but the locally bred okra leaf variety 'Siokra' was more responsive to damage than the normal leaf variety 'Deltapine 90', with increased yield at light to moderate levels of early damage and decreased yield at severe levels. Evidence was found in the data from these experiments for the occurrence of three out of four previously identified physiological mechanisms involved in compensation by the crop plant for damage were observed: damage substituting for physiological shedding, increased boll weight and increased rate of flowering. There was no evidence of the fourth mechanism, increased boll set.

Response of Cotton (*Gossypium hirsutum* L.) to Damage by Insect Pests in Australia: 3. Compensation for Early Season Fruit Damage. K. D. BROOK, A. B. HEARN AND C. F. KELLY.

ABSTRACT Data were analysed from 24 experiments, done between 1984 and 1988 in the Namoi Valley of NSW, Australia, in which cotton crops were subjected to various amounts of damage. There were three sets of experiments: pest management on a research station, pest management on commercial farms and manual disbudding. The okra leafed variety Siokra was infested with fewer pests than the normal leaf DP90, and suffered less damage from a given density of pests. Both varieties compensated for early season damage at low yield levels but not at high levels. The reduction in yield caused by damage at high yield levels was less in Siokra than in DP90.

Two physiological explanations for these effects are offered: (i) where low yield is caused by heavy physiological shedding of fruit resulting from adverse weather or agronomic practices, the shedding caused by pests can substitute for physiological shedding and thus insulate low yielding crops from pest damage; (ii) if the yield of the lower yielding crops is limited by the incomplete interception of radiation, then delaying the termination of the expansion of the canopy will increase yield; early damage can delay the onset of the metabolic stress which terminates expansion of the crop canopy by reducing the rate at which the fruit load increases.

The implications of the results for pest management are discussed. Thresholds should not be raised above the lower end of their current range in Australia except in Siokra crops which are expected to yield less than 7.5 bales per hectare.