SIRATAC PEST MANAGEMENT TRIALS

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SIRATAC users have the option early in the season of using standard thresholds or dynamic thresholds which vary between the standard level and an upper limit. Thresholds are increased if the crop is early and there will be no yield loss. If the crop is late, or if a yield loss would occur, then thresholds are reduced to base level. Dynamic thresholds aim to maintain yield and quality while avoiding unacceptable harvest delays and normally reduce the number of early season sprays by one or two. However, early crop protection is still a controversial subject within the cotton industry, and most growers do not use the dynamic option within SIRATAC.

This article continues the work described in the proceedings of the 1986 Australian Cotton Conference (Brook, Stafford and Hearn, pp. 223-238).

CSIRO pest management trials in the Namoi Valley over the last two years took three forms:

(i) large-scale research trial of various pest management strategies;

(ii) replicated commercial farm comparisons of various pest management strategies;

(iii) a small plot experiment, artificially simulating insect damage by tip, square and boll removal.

We also report here on trials of a new pest management strategy, MULTI (Mid-season Ultra Low Threshold). MULTI incorporates dynamic thresholds early season when compensation occurs and lower thresholds mid-season during the peak boll setting period, to provide maximum boll set.

1. The 1986/87 and 87/88 Large-Scale Research Trials

(80ha field at Myall Vale)

In 1986/87 four spray treatments were applied to three replicates of Siokra 1-1 and Deltapine 90 (DP90) which were managed separately. In 1987/88 four spray treatments were applied to Siokra 1-1, DP90 and Sicala 3-1, which were sprayed together, with the decisions based on Siokra insect counts. The spray treatments were:

1. ULTRA LOW thresholds (half base-level SIRATAC thresholds)
2. STANDARD thresholds (base-level SIRATAC thresholds) = commercial SIRATAC
3. DYNAMIC thresholds (dynamic SIRATAC thresholds) 1987/88 only
4. VERY HIGH threshold (Extra-high dynamic SIRATAC thresholds) 1986/87 only
5. MULTI thresholds 86/87 (extra-high dynamic followed by ultra low SIRATAC thresholds mid-season) 1986/87 only
6. MULTI thresholds 87/88 (dynamic followed by ultra low SIRATAC thresholds mid-season) 1987/88 only

In 1986/87, because of the cool start to the season, the normal dynamic thresholds would have remained the same as the standard threshold, which is how dynamic thresholds are designed to operate in late crops. The opportunity was taken therefore for research purposes, to observe the effect of higher early season thresholds than with normal dynamic, on the VERY HIGH threshold treatment and the MULTI threshold treatment.

Lower insect pressures in the the 1987/88 season are reflected in lower spray numbers compared to 1986/87 (Table 1). The ultra low treatment received many more sprays, the dynamic, very high and MULTI less early season sprays, and MULTI received an extra one or two mid season sprays.

Table 1. Spray numbers, Yields (bales/ha) and 60% open dates for the large scale research trial (yield figures for 1987/88 are preliminary).

1986/87	SIOKRA 1-1			DP90		
	Sprays	Yield	60%open	Sprays	Yield	60%open
ULTRA LOW	17	7.03	14 Apr	17	5.95	18 Apr
STANDARD	11	6.27	17 Apr	9	5.58	24 Apr
VERY HIGH	9	6.33	17 Apr	8	4.80	20 Apr
MULTI	10	6.88	21 Apr	9	5.44	19 Apr

1987/88	Number of sprays	SIOKRA 1-1		DP90		SICALA 3-1	
		Yield	60% open	Yield	60% open	Yield	60% open
ULTRA LOW	11	5.54	16 Apr	4.12	17 Apr	5.41	15 Apr
STANDARD	7	5.64	16 Apr	4.03	14 Apr	5.90	14 Apr
DYNAMIC	5	5.20	16 Apr	3.77	16 Apr	5.53	14 Apr
MULTI	6	5.43	14 Apr	4.32	15 Apr	5.59	13 Apr

Yields in the 1986/87 season (Table 1) for Siokra were significantly greater using ultra low and MULTI strategies followed by similar yields for standard and very high threshold strategies. DP90 had the highest yields with ultra low thresholds followed by standard, MULTI and very high thresholds. There were no significant differences in quality or 60% open dates between treatments.

In contrast, there were no significant differences in yields between pest management treatments in 1987/88. Severe herbicide damage probably reduced overall yield. DP90 had significantly lower yields than Siokra and Sicala (Table 1). 60% open dates and quality were similar between treatments.

For the 1986/87 season the highest net returns (Table 3) for Siokra were achieved using MULTI thresholds, and standard thresholds for DP90. In 1987/88 the highest net returns (Table 3) for Siokra and DP90 were attained using MULTI while in the case of Sicala it was dynamic thresholds. The higher spray numbers

and resultant costs (Table 2) of an ultra low threshold strategy during both seasons, and particularly in the low insect pressure year of 1987/88, did not result in the most profit.

Table 2. Spray costs ($/ha) for the large scale research trial.

		SIOKRA 1-1	DP90	
1986/87	ULTRA LOW	$432	$438	
	STANDARD	$327	$281	
	VERY HIGH	$294	$284	
	MULTI 86/87	$305	$292	
1987/88	ULTRA LOW	$276		Varieties not managed separately
	STANDARD	$166		
	DYNAMIC	$141		
	MULTI 87/88	$158		

Table 3. Net returns* ($/ha) at $400/bale for the large scale research trial.

		SIOKRA 1-1	DP90	SICALA 3-1
1986/87	ULTRA LOW	$2305	$1914	
	STANDARD	$2056	$1928	
	VERY HIGH	$2130	$1617	
	MULTI 86/87	$2310	$1859	
1987/88	ULTRA LOW	$1665	$1110	$1848
	STANDARD	$1732	$1003	$1985
	DYNAMIC	$1682	$1128	$2056
	MULTI 87/88	$1746	$1479	$2015

* See note below

2. The 1986/87 and 87/88 Commercial Farm Trials

2a. ***1986/87 Farm Trials - Standard vs Dynamic Thresholds.*** Two sites were planted with Siokra 1-1 only, one site with DP90 only, and three sites with both varieties. The results (Table 4) show an average saving of 1.4 early season sprays by using dynamic thresholds on Siokra and a saving of 1.25 sprays on DP90.

Table 4. Average spray numbers, yields (bales/ha), and 60% open dates for the 1986/87 commercial farm trials.

	SIOKRA 1-1			DP90		
	Sprays	Yield	60% open	Sprays	Yield	60% open
STANDARD	8.4	6.44	19 Apr	8.5	5.92	26 Apr
DYNAMIC	7.0	6.62	21 Apr	7.3	6.06	23 Apr

Table 5. Average spray costs ($/ha) for the 1986/87 commercial farm trials.

	SIOKRA 1-1	DP90
STANDARD	$220	$247
DYNAMIC	$195	$214

*Note - Net return calculations
Cotton Price = Current at time of trial
Spray costs = (Chemical + Crop Terms Interest) + Application
Gross = Yield x (Base $/bale +- Quality adjustment/bale)
Net returns = Gross - Spray costs

Pest pressure was slightly higher than usual in 1986/87. The yields in the two treatments (standard and dynamic) were statistically similar. DP90 had significantly lower yields than Siokra. There were no quality differences between pest management treatments, and no significant delays in maturity. Net returns were greatest on both varieties by using dynamic thresholds (Table 6). This is in

contrast to the 1985/86 farm trials when DP90 tended to be reduced in yield and profits under dynamic thresholds.

Table 6. Average net returns ($/ha) at $400/bale for the 1986/87 commercial farm trials.

	SIOKRA 1-1	DP90
STANDARD	$2247	$2112
DYNAMIC	$2348	$2201

The trial included one farm at Boggabri, where the dynamic threshold plots yielded more.

The 1986/87 season had a cool start and crops were late. The dynamic procedure took this into account so that dynamic thresholds were lower than in most years. On two farms, there was no difference in spray application between standard and dynamic thresholds.

2b. ***1987/88 Farm Trials - Standard vs MULTI thresholds.*** One field was planted with Siokra 1-1 and Sicala 3-1 in the same field, two were planted with Siokra 1-1 and one planted with Siokra 1-3. Pests were managed using standard SIRATAC and MULTI (dynamic thresholds until 10 January, half standard thresholds until 4 March and standard thresholds for the remainder of the season).

MULTI required less early season sprays and more mid-season sprays than standard SIRATAC, and the overall spray numbers were higher using MULTI, except on Sicala (Table 7). Sicala required one more late season spray (for mites) than Siokra. Yields and 60% open dates for MULTI and standard SIRATAC were not significantly different (Table 7). Cotton quality was similar for both strategies. Siokra 1-3 had a higher quality than Siokra 1-1 or Sicala. Spray costs were about

$23/ha more using MULTI. Higher net returns were achieved using standard SIRATAC thresholds for Siokra 1-1 and Siokra 1-3, while Sicala had higher net returns with MULTI (Table 9).

Table 7. Average spray numbers, yields (bales/ha), and 60 % open dates for the 1987/88 commercial farm trials.

Variety	Sprays		60% open		Yield	
	Standard	MULTI	Standard	MULTI	Standard	MULTI
Siokra 1-1	5.7	6.3	2 Apr	3 Apr	6.24	5.97
Siokra 1-3	5.0	6.0	1 Apr	1 Apr	7.59	7.39
Sicala 3-1	7.0	7.0	4 Apr	5 Apr	6.23	6.65

Table 8. Average spray costs ($/ha) for the 1987/88 commercial farm trials.

	SIOKRA 1-1	SIOKRA 1-3	SICALA 3-1
STANDARD	$154	$154	$209
MULTI	$176	$184	$225

Table 9. Average net returns ($/ha) at $400/bale for the 1987/88 commercial farm trials.

	SIOKRA 1-1	SIOKRA 1-3	SICALA 3-1
STANDARD	$2118	$2670	$2069
MULTI	$2028	$2571	$2217

The 1987/88 season had very low insect pressure, particularly early season, and below average temperatures during February, an important boll setting period. The benefits of MULTI during such a season could be negated since early season sprays were minimal regardless of pest management strategy, and mid-season conditions were less than optimal.

3. The 1986/87 Small Plot Disbudding Trial

This experiment simulated precisely the effects of specific amounts of insect damage to a cotton plant. The treatments include tip, square, and fruit removal by hand at various times of the season. The experiment was sprayed weekly to exclude insect damage. There were two varieties (Siokra 1-1 and DP90), 14 treatments, 7 replicates, and 10 plants/metre. Each subplot consisted of three parallel 2-metre lengths of row. The yield measurements were made on the middle metre of the middle row. Treatment descriptions and results are summarised in Table 10. It should be noted that the damage on most of these treatments is well in excess of that tolerated in even the least conservative version of SIRATAC.

Table 10. Myall Vale disbudding trial. Yields (kg of lint /ha) and 60% open dates (days early (+) or late (-) relative to the control: DP90 3 April; Siokra 28 March).

		YIELD		60% OPEN	
Treatment	Description	DP90	SIOKRA	DP90	SIOKRA
Nil	Control (no damage)	1658	2046	0	0
Early Season Tip Damage					
ET	Early tipping out at 4 true leaves (18 Nov)	1668	2257	-2	-2
MT	Tipping out at 6 true leaves (24 Nov)	1761	2159	-4	-4
LT	Late tipping out at 1st square (4 Dec)	1720	2222	-3	-3
Early Season Fruit Damage					
Light	Equivalent of 2 larvae/m (17-29 Dec)	1705	2159	-3	0
Medium	Equivalent of 4 larvae/m (17-29 Dec)	1679	2294	-2	-3
High	Equivalent of 6 larvae/m (17-29 Dec)	1627	1983	-5	-5
100%	100% of squares removed to 2 Jan	1670	1723	-13	-15
Mid Season Fruit Damage (20 Jan - 2 Feb)					
Medium	Equivalent of 4 larvae /m	1695	2143	+1	-1
High	Equivalent of 6 larvae /m	1728	2184	-2	+2
Late Season Fruit Damage (16-27 Feb)					
No 1	Equivalent of 4 larvae /m on DP90 (3 on Siokra)	1611	2108	-1	+2
No 2	Equivalent of 6 larvae /m on DP90 (4 on Siokra)	1609	1974	+2	+2
Combination of treatments					
ET High	ET and Early Season High	1621	2146	-6	-6
LT High	LT and Early Season High	1754	2028	-10	-10

Siokra yielded significantly more than DP90. With the exception of the 100% treatment on Siokra, there were no statistically significant differences in yield from the control within a variety. However, some trends can be seen. Tipping out, especially on Siokra, increased yield. On Siokra, higher levels of early season fruit damage (6 larvae/m and 100% square removal) reduced yield in this trial; these treatments recovered in terms of boll numbers, but the weight of cotton per boll was reduced. Removal of all squares during this period results in unacceptable delays, and may reduce yield. Low to medium levels of early season fruit damage to Siokra stimulated yield. Deltapine 90 recovered from high levels of damage in this trial, but yield remained below that of Siokra. The only yield reduction on DP90 was with high levels of late season damage. Siokra was also reduced in yield with higher levels of late season damage.

Summary

The disbudding trial demonstrates the capacity of the cotton plant to compensate for early season damage. Indeed, light to moderate amounts of early season damage seemed to increase yield.

Table 11. Average sprays, yield (bales/ha), 60% open dates, and net returns ($/ha) at $400/bale of all the standard vs dynamic SIRATAC trials done over the last three seasons: 1985/86 - 87/88 (12 trials on Siokra 1-1 and 11 on DP90).

		Sprays	Yield	60% open	Net return
Siokra 1-1	Standard	7.6	6.94	9 Apr	$2525
	Dynamic	6.1	7.09	10 Apr	$2595
DP90	Standard	8.1	5.86	11 Apr	$2091
	Dynamic	6.2	5.56	11 Apr	$2013

In these recent trials, Siokra has generally performed well with dynamic thresholds and its average yield is on the better side of standard Siratac, while saving 1.5 sprays (Table 11). Average maturity dates and quality are unaffected. However, preliminary analyses of our long term data base causes us to have reservations about using dynamic thresholds on high yielding Siokra crops. If yield in excess of 8 bales/ha are anticipated you should use standard SIRATAC.

DP90 has been less consistent with its performance. In the 1986/87 disbudding experiments DP90 performed well, but not in the dynamic threshold trials or the high damage disbudding treatments in previous experiments. The dynamic thresholds used in these experiments exposed DP90 to a longer duration of insect attack in the early squaring phase than was mimicked by the disbudding experiment. We recommend that dynamic thresholds not be used on DP90 crops.

There is a myth that dynamic thresholds consistently cause late crops; the last three season's experiments show that they may in fact be earlier. As far as we know, no commercial grower has used dynamic thresholds and adhered to the recommendations. Growers are rightly concerned about late crops and we said in the 1986 conference paper "Since a grower is unlikely to be able to harvest all of his farm within the period of the delay, it is suggested that the farm be split. One part could be managed with standard thresholds and the other with dynamic thresholds to save early season sprays." It is important to conserve endosulfan from resistance. Reducing early season sprays will assist this.

We give a recommendation to use dynamic thresholds on Siokra with one other warning: be diligent in insect checking. Standard SIRATAC provides a greater buffer against poor insect checking. If your checking is not good but only average, use only standard SIRATAC.

It is worthwhile to point out that on three of the commercial farms, the fields adjacent to the trial blocks received an extra three or four sprays than the trial blocks in which SIRATAC recommendations were adhered to. Yield was unaffected by the sprays in excess of the SIRATAC recommendations.

Use of SIRATAC recommendations, and in particular low insect pressure seasons as seen in 1987/88, can still greatly increase profits by targeting sprays at true damaging insect populations. In low insect pressure seasons, spray decisions are not 'black and white'. SIRATAC has proven to help growers through the 'grey area' of whether to spray or not and maximise profits.

The 1987/88 season had low insect pressure and a cool boll setting period. Under these conditions, yield was similar regardless of pest management strategy. MULTI may still prove to be a high yielding strategy but has not been thoroughly tested and we are hesitant to recommend it without further field trials.

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