

PROGRESS IN BREEDING FOR VERTICILLIUM WILT TOLERANCE

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The fungal disease Verticillium wilt has been of sporadic importance in irrigated cotton for many years. It has traditionally been most serious in cool seasons in parts of the Macquarie valley, around Wee Waa and on the Darling Downs. Crop rotation (particularly with cereals) and other cultural practices help to prevent buildup of the disease. After a period of relatively low Verticillium levels for much of the 80's, the disease has made a pronounced comeback in recent seasons. During the 1988/89 season the disease was common in almost all areas from Warren to Biloela. Last season Dr Stephen Allen even found quite severe outbreaks at Bourke where, because of the very hot summers, the disease would not be expected to flourish.

The reasons for the apparent upsurge in Verticillium are not completely clear. However it is probably a combination of factors including seasons with some cool periods coupled with a steady build up of inoculum as the period of cotton culture lengthens. This inoculum build up is undoubtedly exacerbated by the amount of land continuously cropped to cotton without rotation. Unfortunately also the recirculation and reuse of tail water, while most necessary, also helps to distribute the disease. Solutions to the Verticillium problem are not easy and a many pronged attack is needed. While crop rotation and other cultural practices are vital, varieties with tolerance to the disease can also provide an important weapon. As breeders we are acutely aware of the potential seriousness of Verticillium and have been putting increasing emphasis on the search for tolerant varieties. It should be emphasized however that there is no full resistance to Verticillium as there is to bacterial blight, only degrees of tolerance.

PROGRESS

The first varieties from our programs which possess better ability to cope with Verticillium have now been released. The normal leaf CS 189 will be widely available for 1990 plantings. In the large scale CSD trials on problem

Verticillium blocks at Auscott, Narrabri over the last two seasons and in a separate Auscott conducted trial in 1989/90, the incidence of Verticillium in this variety has been assessed as similar to Deltapine 90 and less than Siokra. However CS 189 has produced much better yields than either of these varieties (Tables 1 and 2).

Two other releases with some tolerance to Verticillium are the short season varieties Siokra S324 and CS 6S. Under high Verticillium pressure these two have yielded well at such places as Breeza and Cecil Plains despite having large numbers of plants infected. Unfortunately seed of both for 1990 plantings is very limited.

Our most promising Verticillium tolerant line developed so far is a normal leaf type to be released as Sicala V1. It will undergo major seed increase in the 1990/91 season. V1 was developed in the short season breeding program although it is only of medium maturity. The ability of V1 to tolerate high Verticillium levels was best illustrated in the 1988/89 season when the disease was very common in our Australian Cotton Cultivar Trials (ACCT). Over the five most severely affected trials it was the superior performer and it was visually less effected by the disease as illustrated by our assessments of disease severity (Table 3). While it was rated slightly worse on visual symptoms than the tolerant variety Namcala it was far superior in yield. In the most severely Verticillium affected trial which was on the Darling Downs V1 outyielded the next best current commercial variety (S324) by 23%.

During the 1989/90 season counts of the proportion of Verticillium infected plants by Dr Stephen Allen in the CSD trial at Auscott, Narrabri and in the Verticillium nursery at Narrabri Research Station revealed that Sicala V1 had the lowest rate of infection (35 and 28% of the next lowest variety Deltapine 90 with 44 and 47%). In the CSD trial V1 yielded about the same as CS189. Fibre quality of Sicala V1 is very good (Table 4) as indicated by the use of the Sicala name.

CONCLUSIONS

The availability of CS189 and to a limited extent , CS 6S and Siokra S324, for 1990 planting will certainly assist farmers with a serious Verticillium wilt problem. For 1991 plantings Sicala V1 will also be available and should prove to be a further advance with its ability to produce good yields and fibre quality

under heavy Verticillium pressure. Our efforts to produce even better Verticillium tolerant lines is continuing and we are making use of the Verticillium nursery developed by Dr Stephen Allen at Narrabri Research Station to screen lines. One of our primary aims is to develop a highly Vert tolerant okra leaf line in order to assist in the control of Heliothis and mites, either or both of which are often serious problems in the bad Verticillium areas.

Thus our development of Verticillium tolerant varieties is proceeding well, but it should be emphasized that tolerant varieties are only part of the answer to Verticillium and farmers need to also look at their management practices. For example, even tolerant varieties can be badly affected by Verticillium if the stand is poor!

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Table 1. Yield of CS 189 compared to other commercial varieties in two CSD Narrabri trials where high levels of Verticillium wilt have been encountered.*

Variety	Year sown	Yield as % of Siokra 1-4	% of plants infected with Verticillium †
CS 189	1988	113	57
	1989	112	45
Sicala 33	1988	109	77
	1989	101	63
Siokra S324	1988	109	79
	1989	100	78
Siokra L22	1988	100	73
	1989	105	65
Siokra 1-4	1988	100	76
	1989	100	61
DP90	1988	98	61
	1989	91	44

* The 1989 trial suffered bad (47%) hail damage in February. Bacterial blight was present to a slight extent in DP90 in both trials.

† Counts supplied by Dr S.J. Allen, NSW Agriculture & Fisheries.

Table 2. Yield of CS 189 compared to other commercial varieties in an Auscott, Narrabri conducted trial in 1989/90 where high levels of Verticillium wilt were encountered. (Data supplied courtesy of Mr D. Anthony, Auscott Ltd).

Variety	Yield as % of Siokra 1-4	% of plants infected with Verticillium †
CS 189	130	64
Sicala 33	110	72
Siokra 1-4	100	86
DP90	99	69

† Counts supplied by Dr S.J. Allen, NSW Agriculture & Fisheries.

Table 3. Mean yields and disease severity rating over the five most severely Verticillium affected trials in the 1988/89 ACCT.

Variety	Yield as % of Siokra 1-4	Disease rating*
Sicala V1	115	1.67
Siokra S324	111	2.58
CS 189	101	2.08
Sicala 33	100	2.83
Siokra 1-4	100	3.33
Siokra L22	98	2.58
DP90	97	2.25
Namcala	91	1.50

* Plots were rated for disease severity on a scale of 1 to 5 representing increasing level of symptoms and proportion of infected plants.

Table 4. Fibre quality of Sicala V1 compared to some commercial varieties over 17 sites in the 1988/89 and 1989/90 ACCT.

Variety	Length (ins)	Strength (g/tex)	Micronaire
Sicala V1	1.16	29.3	4.1
Siokra 1-4	1.19	26.8	4.0
Siokra L22	1.20	27.8	3.9
Sicala 33	1.21	28.6	4.1
CS 189	1.16	27.2	4.0
DP90	1.15	28.3	4.2

