

Sicot F-1: a variety with increased resistance to Fusarium wilt

Peter Reid¹, Stephen Allen², Joe Kochman³, Warwick Stiller¹, Greg McNamara², John Lehane³ and Greg Constable¹

¹CSIRO Plant Industry, Narrabri; ²Cotton Seed Distributors, Wee Waa; ³DPI&F Queensland, Toowoomba; all with the Australian Cotton CRC.

Sicot F-1 is a new cotton variety released in 2004. It has been developed specifically in response to the appearance of a new unique strain of the Fusarium wilt pathogen in Australia. This article describes the identification of introduced germplasm with greater resistance to Fusarium wilt than was evident in local varieties and also in varieties resistant to other strains of the pathogen in other countries. The development of Sicot F-1 from that material is described. The level of resistance is double that of the standard Sicot 189.

Fusarium wilt of cotton in Australia, caused by the soil-borne fungus *Fusarium oxysporum* *vasinfectum*, was first noticed and identified by Joe Kochman on the Darling Downs in 1993. The pathogen is thought to have been present as a native on weeds and well-suited to susceptible varieties of cotton grown through the 1980s. The pathogen is very virulent, capable of killing 100% of plants of a susceptible variety when high levels of inoculum are present. The disease has spread to and identified in all cotton growing regions in eastern Australia except Emerald, lower Namoi, Lachlan Valley and Tandou. Farm hygiene and other Integrated Disease Management practices are also important and are promoted in many venues. This paper describes the identification of resistance and development of a new variety.

When the disease was first discovered, it was found by QDPI in screening tests that most available varieties at that time were very susceptible. Resistance was negligible in varieties such as Siokra 1-4 and CS50; intermediate in varieties such as Sicala V-2; and with some degree of resistance in Sicot 189. However, under heavy disease pressure, even Sicot 189 could have major loss of stand and yield. In 1994, CSIRO Plant Industry provided a number of varieties from their germplasm collection at Narrabri for testing in Fusarium nurseries established by QDPI to measure whether better resistance was available. This collection initially sourced two varieties from each state in the US and two varieties from each other country where varieties or lines were available.

The results of this screening showed the virulence of our strains of the pathogen, with most varieties from all countries being relatively sensitive and of low resistance. This observation included varieties from the US with resistance to their Fusarium wilt – nematode complex, highlighting the difference in disease strains. However, one line from India showed up with greater resistance. It is an old line with complex pedigree involving *Gossypium barbadense* (as in Pima cotton), as opposed to our standard varieties of *Gossypium hirsutum* used in Australia. It is relatively low yielding, late maturing, with hairy leaves and moderate fibre quality.

Fortunately CSIRO Plant Industry already had crosses between CSIRO varieties and this line so that material was used for further crossing with CSIRO varieties at Narrabri. The resulting population 97060, was screened at Narrabri in early generations for plant type, bacterial blight resistance and fibre

properties, to provide a number of sister lines for resistance screening in Fusarium nurseries on the Darling Downs, beginning in 1999.

During this time plant pathologists were refining the protocol for measuring and reporting resistance in cotton varieties. The present system of stating resistance as a percentage of Sicot 189 was developed. This enables standardisation of values from different sites and seasons.

Through four years of screening in Fusarium nurseries, line CSX69 was identified as having superior Fusarium resistance and good agronomic characteristics and fibre quality and is being called Sicot F-1. Originating seed of all lines had been maintained at Narrabri, so it was not necessary to have quarantine planting seed taken from the Fusarium nurseries. This Narrabri sourced seed was seed increased in the 2002/03 and 2003/04 seasons by Cotton Seed Distributors and is available commercially for the 2004 sowing.

Performance

In the absence of Fusarium, Sicot F-1 has averaged 8% less yield than Sicot 189 (Table 1). This difference was greatest (up to 20%) in southern locations such as Hillston, Warren and Breeza, but only 5% in central locations. In Fusarium nurseries Sicot F-1 exhibited a 32% INCREASE in yield, due to greater survival. Thus it is clear that Sicot F-1 is a specialist variety for situations of heavy incidence of Fusarium wilt.

Fibre properties have been very similar to Sicot 189 (Table 1).

Table 1. Relative yield and fibre properties of Sicot F-1 compared with Sicot 189. Relative yield (RY) and fibre properties are from 19 experiments in the 2000/01, 2001/02 and 2002/03 seasons at all growing regions. Relative yield in Fusarium nurseries (FY) and Fusarium Resistance Rank (FRR) are from five experiments in Fusarium nurseries on the Darling Downs in the same seasons. Fibre length, strength and micronaire measured by HVI; fibre maturity and fineness measured by Shirley FMT.

Variety	RY (%)	FY (%)	FRR	Length (inch)	Strength (g/tex)	Micronaire	Maturity (%)	Fineness (millitex)
Sicot 189	100	100	100	1.18	30.9	4.3	80	178
Sicot F-1	92	132	220	1.17	31.4	4.1	81	173

Sicot F-1 represents only a start of breeding for further resistance to Fusarium wilt. Current research aims to increase yield potential and to seek even better sources of resistance. Bollgard II versions of Sicot F-1 also began evaluation in 2003/04 in a Fusarium nursery.

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