



# Cotton blends



The seeds of these three native cotton species lack the long white lint of commercial cotton that has made it such a valuable fibre crop.

The fungus-resistant qualities of Australia's Sturt's desert rose may be called upon to protect Australia's \$1.7 billion cotton industry from the devastating impacts of Fusarium wilt.

CSIRO and the Queensland Department of Primary Industries (QDPI) are investigating a range of countermeasures including traditional breeding and gene technology, identifying wilt-resistant varieties, and implementing crop management practices, such as mulching the cotton stubble and crop rotation.

Fusarium wilt was detected in Australia eight years ago by the QDPI, and its origin is a mystery.

The fungus enters the cotton plant's roots and spreads through the vascular system, blocking the flow of water and nutrients and causing the leaves to wilt and the plant to die. The severity of the disease varies from year to year.

The two problem Fusarium strains appear to be unique to Australia. They may have evolved spontaneously, existed in native bushland, or arrived from another country where they were not recognised.

Dr Curt Brubaker, Dr Helen McFadden and their colleagues at CSIRO Plant Industry and Dr Natalie Moore's team at QDPI are searching for a solution in the gene pools of native Australian cotton plants.

Commonly called desert roses, native cottons occur in the arid and semi-arid zones and are mostly spindly looking shrubs with bright hibiscus-like flowers.

They are cotton plants in name only. They belong to the cotton genus, *Gossypium*, but their seeds lack the long white hairs or lint that we know as cotton fibre and hence fail to produce the fluffy bolls typical of domesticated cotton.

'Australia has 17 wild cotton species and we are testing these for resistance to Fusarium wilt in the hope of finding genes that we can transfer to domesticated cotton lines to confer disease resistance,' Brubaker says.

Sturt's desert rose, *Gossypium sturtianum*, is the most promising donor species identified so far. Not only does it seem to show good Fusarium resistance, but unlike domesticated cottons, its seeds lack compounds (terpenoid aldehydes) known as "gossypols" which are toxic to non-ruminant livestock and humans.

These toxic compounds are useful to cotton plants as they also occur in the leaves and stems where they deter insect and microbe attack. In agriculture, however, they prohibit the use of cotton seeds for oil and non-ruminant stock feed, unless the gossypol is removed.

The researchers are trying to answer some key questions. In particular, do the



**Above:** Native cottons or desert roses thrive in the more arid areas of Australia and bear little resemblance to their domesticated cousins.

**Left:** Sturt's desert rose has stunning flowers, but scientists are more interested in its disease resistance and non-toxic seeds.

genes for Fusarium resistance and gossypol-free seeds in Sturt's desert rose work when they are integrated into cotton? Do other native cottons show resistance? How is the resistance controlled genetically? And can they transfer the genes to commercially cultivated cotton varieties?

Australian cottons do not interbreed naturally with cotton crops. This is not surprising, given that the dominant

commercial cotton species, which comprises 90% of the world's cotton production, first arose half-way around the world, in or near Mexico.

Hybrids between Sturt's desert rose and domesticated cotton are sterile, mainly because the two species have different numbers of chromosomes.

Brubaker and his colleagues have overcome this hurdle by using a chemical called colchicine to alter the chromosome number in the native plant. They are now progressively back-crossing hybrids with the cotton parent and testing the resulting seedlings for Fusarium resistance in glasshouse trials.

'If we can identify the gene or genes responsible for Fusarium resistance, and perhaps also for gossypol-free seeds, in the native plants, the challenge will be to fully integrate them into commercial cotton varieties with their high yields, compact form, and other desirable traits,' Brubaker says.

The scientists from CSIRO and QDPI will test several conventionally-bred, hybrid cotton lines containing their novel desert rose genes this season.

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**Steve Davidson**



The researchers are looking for agriculturally desirable traits in several native cottons.

This one is known as *Gossypium enthyale*.