

EXECUTIVE SUMMARY

In the regions visited in the USA, black root rot of cotton does not appear to be as severe as in Australia, probably because of two factors: the lighter soils in which cotton is grown in the USA are less conducive to the disease and long term rotations with non-host crops are practiced. It is also feasible that the strains of the black root rot pathogen, *Thielaviopsis basicola*, in Australia are more pathogenic than those in the USA but this possibility remains to be tested.

A high degree of host specificity exists among different strains of *T. basicola*. Therefore, while the pattern of geographic dispersal of black root rot in Australia is consistent with the introduction of a virulent pathogen, there is an alternative explanation: that continuous cotton monoculture has selected for virulence in a population that was previously endemic in cotton growing regions.

Fungicidal and biological seed treatments used in the USA do not control black root rot adequately in the field. The possibility of adverse interactions between insecticides and fungicides has been noted. The fungicide benomyl, although not used commercially, has shown some activity against *T. basicola*.

Summer flooding does not eradicate *T. basicola* and hence gives temporary control (up to four years of cotton). Summer flooding is constrained by topography and the availability of water, and is not widely practiced in the USA.

In the soils in Arkansas, biofumigation with woolly pod vetch gives a high degree of control against black root rot with positive economic returns. In California, rotation with onions and garlic is reported to give effective control. Rotation with sorghum can result in lower levels of black root rot than in continuous cotton but there is no evidence that this effect is any different to a bare fallow.

There is no evidence for resistance to black root rot in any cultivars or breeding lines of cultivated cottons. Resistance to *T. basicola* may potentially be found in wild species of cotton, possibly *Gossypium arboreum*. Transformation of cotton with genes for novel chemicals with antifungal activity is a potential source of resistance in future.

Root border cells can play a role in the susceptibility and resistance of plants to pathogens. In cotton, root border cells appear to act as decoys for *T. basicola* and prevent lethal infection of the vascular tissue via the root tip. The potential for enhanced mortality of cotton when *T. basicola* enters the vascular tissue through interaction with root knot nematode has been clearly established. Since *T. basicola* is now widely distributed in Australia the introduction or spread of nematodes (or any other pathogen that may enhance penetration of the vascular tissue of roots by *T. basicola*) could have dire consequences for cotton production.

Collaborative links were established with researchers in California, Arkansas and Arizona. The exchanges of information on black root rot research has provided new leads for development of a management strategy for black root rot in project DAN122C and helped avoid unnecessary duplication of research. Collaborative research will be continuing with Professor Rothrock and Professor Hawes.