



Australian Government
**Cotton Research and
Development Corporation**

TRAVEL & CONFERENCE REPORT

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: 01CRDC007

Project Title: Cotton Leaf Curl Virus Study Tour

Project Commencement Date: 21/07/07 **Project Completion Date:** 31/07/07

Research Program: 1 People and Knowledge

Part 2 – Contact Details

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Part 3 – Travel Report

PLEASE NOTE: the comments below are accompanied by a more comprehensive report, prepared by the study group as an industry resource, which is submitted with this report.

1. A brief description of the purpose of the travel.

Cotton leaf curl virus (CLCuV) is the causal agent of a damaging disease of cotton (CLCuD) that is caused by a number of different begomoviruses and vectored by Silver Leaf Whitefly (SLW). CLCuV is exotic to Australia but is categorised as one of our industry's most serious Emergency Plant Pests. Crop losses can be devastating.

The cotton industry biosecurity plan (2006) rates the overall pest risk from this pathogen complex as high to extreme. While prior to the introduction of *Bemisia tabaci* (B biotype) the risk of introduction may have been considered low, clearly now, with the widespread distribution of this insecticide resistant vector the impact of a disease incursion would be very serious for our industry.

The purpose of this scientific exchange was for a highly focused stakeholder based group from the Australian cotton industry to visit an overseas cotton growing area where CLCuV is endemic and growers must manage both the insect vector and plant pathogen on a routine basis. This exchange also provided an introduction to scientists conducting research at various institutes on the management of this disease and will allow for ongoing information exchange with leading researchers on this pathogen.

2. What were the:

a) major findings and outcomes

Cotton leaf curl virus (CLCuV) would present an major challenge to the Australian cotton industry should it breach our quarantine system or indeed develop from recombinant like-viruses already in Australia and/or our south east Asian neighbours. Depending on the ultimate distribution of the virus, all areas where whiteflies are present could, in theory, be at risk from the disease as even sub-threshold levels of SLW present a significant risk for virus transmission.

The study group has produced a comprehensive report (attached) for submission with this travel report which outlines in detail the current situation with the disease in Pakistan as well as our impressions of contributing factors and how may compare and contrast to the Australian situation.

There is no doubt that the key research response in Pakistan has been the relentless pursuit of CLCuV resistant germplasm. The efficiency of the vector all but rules out insect pest control as a viable or sustainable management option. The development of resistant cotton varieties in Pakistan to the initial CLCuV epidemic of the early 1990's represented a swift response to a national emergency. However, the emergence of a virulent new species of CLCuV (Burewala) has had longer term implications for the development of immune cotton germplasm which so far has not been overcome through traditional plant breeding.

Compared to the remarkably diverse farming system of Pakistan which greatly advantages the biology and ecology virus and vector, CLCuD would still present many challenges in Australia even with an enhanced commitment to farm or areas wide hygiene.

An important medium term priority for the Australian industry should be to have the Australian germplasm portfolio ranked for susceptibility to CLCuV. A longer term objective for this emergency plant pest would then include the development of more resistant but agronomically acceptable cultivars. In addition to this, collaborative networks with germplasm developers and scientific experts should be encouraged.

The development of single site resistance to individual strains of CLCuV within a breeding program may leave it vulnerable due to the changing nature of the virus complex and the fact that we don't know what strain of the virus would make it to Australia, should an inclusion occur. Research programs in Pakistan are advanced in developing broad spectrum resistance via genetic modification and interspecific breeding approaches and developing molecular markers for resistance. Whilst no market- ready products have come out of these programs yet, they are showing a lot of promise. It should be recommended that collaborative networks with germplasm developers and scientific experts should be encouraged.

This scientific exchange led the study group to make valuable contact not just with Pakistani researchers on CLCuV but also with a Queensland Department of Primary Industries and Fisheries, virologist, Ms. Cherie Gambley who was in Pakistan at the time on a Biosecurity CRC funded CLCuD study leave trip. It is vitally important that we have diagnostic expertise in Australia for a range of emergency plant pests and importantly for the cotton industry to have capacity with specific pests of cotton itself. This is especially important in the challenging area of virology.

The group would also like to acknowledge that the concept of scientific exchange through an industry representational stakeholder group has proven very valuable for a number of crop protection issues in the past and that this biosecurity study tour has joined the list of successful models for this approach.

b) other highlights

The Pakistan economy is heavily dependent on the value adding of primary production. Cotton is the second most important economic crop after wheat. Wheat, however, is not exported so much as consumed with every meal (at least 3 times daily). Cotton textile exports represent an astonishing 60% of GDP and it is estimated the cotton supply chain affords a proportion of family income to one in every ten households.

The industry receives a high level of support from government through a significant investment in research and development, both at the provincial and national level. R&D is also partly supported through a bale levy collected at gining. There is a focused priority on plant biotechnology as a means to overcome a number of agronomic problems but also equal determination to explore potential traits that add further value to cotton as a textile product and underpin its important place in the national economy.

3. Detail the persons and institutions visited, giving full title, position details, location, duration of visit and purpose of visit to these people/places.

Dr Rob Briddon, Visiting Professor (presently working at NIBGE under the Foreign Faculty Hiring Program of the Higher Education Commission, Pakistan) National Institute for Biotechnology and Genetic Engineering (NIBGE), P.O. Box. 577, Jhang Road, Faisalabad, Pakistan.

Dr Muhammad Arshad, Director, Central Cotton Research Institute, PO Box 572 Old Shujabad Road, Multan, Pakistan.

Dr Mushtaq Ahmad, Deputy Chief Scientist, Plant Protection Division, Nuclear Institute for Agriculture & Biology, Jhang Road, Faisalabad, Pakistan.

Dr Rehmat Ali, Head / Senior Scientific Officer, Central Cotton Research Institute, PO Box 572 Old Shujabad Road, Multan, Pakistan.

Dr M. Saleem Haider, Assoc. Professor, School of Biological Sciences, University of Punjab, New Campus, Lahore, Pakistan

Dr M. Ahsanul Haq, Director, Plant Protection Division, Nuclear Institute for Agriculture & Biology, Jhang Road, Faisalabad, Pakistan.

Dr Iftikhat Ahmad Kahn, Principal Officer, University of Agriculture, Faisalabad, Pakistan.

Dr Shahid Mansoor, Plant, Head of Biotechnology Division, National Institute for Biotechnology and Genetic Engineering (NIBGE), P.O. Box. 577, Jhang Road, Faisalabad, Pakistan.

Tahir Naeem, Manager Seed Production, Ali Akbar Seeds, 49-B-II, Industrial Estate, Multan, Pakistan.

Dr Mehboob-ur-Rehman, Senior Scientific Officer, National Institute for Biotechnology and Genetic Engineering (NIBGE), P.O. Box. 577, Jhang Road, Faisalabad, Pakistan.

Dr Muhammad Rashid, Director General Agricultural research, Ayub Agricultural Research Institute, Faisalabad, Pakistan.

Dr Muhammad Saeed, Plant Breeding & Genetics, National Institute for Biotechnology and Genetic Engineering (NIBGE), P.O. Box. 577, Jhang Road, Faisalabad, Pakistan.

Dr Yusuf Zafar, Agriculture and Biotechnology, Pakistan Atomic Energy Commission, Islamabad, Pakistan

Dr Zafar M. Khalid, Director, National Institute for Biotechnology and Genetic Engineering (NIBGE), P.O. Box. 577, Jhang Road, Faisalabad, Pakistan.

Dr Zahid Iqbal Anjum, Senior Scientific Officer Cotton Breeding, Central Cotton Research Institute, PO Box 572 Old Shujabad Road, Multan, Pakistan.

4. a) Are there any potential areas worth following up as a result of the travel?

The first edition of the Cotton Industry Biosecurity Plan (IBP) November, 2006 only briefly deals with the key areas of surveillance and contingency planning. There is considerable effort required for the development of more robust approaches to both of these areas in future revisions of the IBP.

The interest, awareness and networks created by this study tour have created an opportunity for CLCuV to be a lead cotton Emergency Plant Pest (EPP) example? for the development of both improved surveillance and contingency planning. Creating a pathway, as it were, for the resolution of these activities and plans for the remaining cotton EPP's.

b) Any relevance or possible impact on the Australian Cotton Industry?

Until recently the Australian cotton industry has been fortunate to not have had a emergency plant pest incursion that has seriously impacted on the industry. However, the breach of quarantine in the early nineties by the B biotype of *Bemisia tabaci* (Silver Leaf Whitefly) on imported live Poinsettia plants have made the industry increasingly aware of the importance of biosecurity threats and preparedness.

The cotton industry biosecurity plan (2006) rates the overall pest risk from this pathogen complex as high to extreme. While prior to the introduction of *Bemisia tabaci* (B biotype) the risk of introduction may have been considered low, clearly now, with the widespread distribution of this insecticide resistant vector the impact of an incursion would be very serious for our industry.

CLCuD has been reported from Pakistan, India, Sudan and Nigeria. The begomoviruses and DNA- β components associated with the disease in each of these areas are quite distinct and it is thought the disease has developed locally (Bridson 2003) rather than through the long-distance distribution of infected planting material or viruliferous whiteflies.

In the epidemic years of the early nineties there were dramatic yield losses even leading to civil unrest due to the uncertainty of the unfolding situation. Estimated losses from the epidemic years were reported to be some \$US1Billion in lost GPD. Even now with some varietal resistance to the original virus species it is estimated CLCuD is costing around 2M bales per year in lost production nationally. Yield varies depending on the time of infection and the susceptibility of the variety but the potential negative impact on regions where the vector is now active is clear.

In Australia it is likely that the disease would be most severe in hot regions such as central Queensland, St George as well as new areas in northern Australia in which silver leaf whitefly activity is typical early in the life of the crop.

5. How do you intend to share the knowledge you have gained with other people in the cotton industry?

Members of the study group have delivered verbal (PowerPoint) presentations to the 2007 Cotton CRC Science Forum, ACGRA Annual General Meeting, Dawson Valley CGA, Macintyre Valley CGA, Cotton Seed Distributors Board, and numerous individual consultations. In addition there are plans for a presentation to the 2008 Australian Cotton Conference.

The accompanying written project report will be provided to CRDC and the Cotton as well as members of the Cotton Industry Biosecurity group. An extension plan will be prepared in consultation with the CRC National priority Team and editorial articles in CRDC Spotlight, The Australian Cottongrower Magazine, Australian Cotton Outlook and Cotton Magazine will be prepared. A short video will appear on CSD's Web on Wednesday.

A media release was distributed on the groups return to highlight the study tour and create initial interest and awareness in the disease and biosecurity preparedness generally.