Report Cover Sheet for Annual & Final Reports

The following Reporting Requirements MUST BE MET

All Projects
You must submit an **ANNUAL PROGRESS REPORT** by the first Friday in February 1999, detailing the progress of your research. NOTE: IF you are seeking continuation of funding for 2000–2001 for the project, this report will form the basis for CRDC's consideration of ongoing funding. Please complete the budgetary requirements if this is a continuing project.

Terminating Projects
A **FINAL REPORT** must be submitted within three months of completion of the project. This applies in **ALL** cases including research projects, travel, conference attendances, postgraduate, postdoctoral and funded capital items.

Tick Report Purpose

Annual Progress Report *(Due 1st Fri Feb. to determine continuation of funding)*

Final Report (Due 30 September or 3 months after completion of project)

Actual start date: ***8th Feb 1999***

Anticipated completion date: ***14th Feb 1999***

OFFICE USE ONLY:
Date of receipt:

Project title (as per original application)
Conference Attendance: Keystone Symposia – Interactions and Intersections in Plant Signalling Pathways, Couer d'Alene, Idaho, USA

CRDC Project Code
ANU5C

CRDC Responsible Director (if known)

Organisation **Australian National University**
CSIRO Plant Industry, Canberra

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Final Report

What was the background of the project?

This travel grant (ANU5C) was in support of a postgraduate scholarship (ANU3C) granted for research into the molecular biology of gossypol biosynthesis in cotton. Gossypol is a defense chemical made by the cotton plant that is important for protection against pests and diseases. Unfortunately gossypol taints the cottonseed and is expensive to remove for oil and feed applications. The biosynthesis of gossypol is moderately characterised at the chemical level however little is known about the genes encoding key enzymes of this pathway. By understanding the molecular biology of gossypol biosynthesis we would be in a firm position to use this knowledge to manipulate the pathway for improved insect and pest tolerance as well as increasing the value of byproducts such as cottonseed.

A field of increasing interest to plant molecular biologists is the signalling mechanisms involved in controlling the regulation of gene expression. The activity of most genes in the plant is finely controlled by various factors such as hormones, development, light, stress, disease and many other environmental cues. Such regulation of gene activity is important in ensuring the plants can grow, develop and yield well, by responding to their environment adequately and changing the profile of gene expression as a direct result of the stimuli. We have cloned one of the key enzymes involved in gossypol biosynthesis – cadinene synthase. Like so many other genes, the expression of cadinene synthase is regulated in response to environmental cues. In this case the cue is infection with the Bacterial Blight pathogen, where cadinene synthase message levels increase markedly, leading to increased gossypol compounds for plant defense. Other plant systems have demonstrated the involvement of signalling cascades in eliciting the response and this is presumably also the case for cadinene synthase.

What were the project objectives and to what extent were these achieved?

By attending the conference 'Interactions and Intersections in Plant Signalling Pathways' it was intended that knowledge could be gained concerning cutting edge results and techniques in the field of plant signal transduction which may be applied to the core project. In addition, the conference provided an opportunity to report results of the CRDC funded core project, at an international level.

A discussion of the results, including an analysis of research outcomes compared with the objectives?

The conference proved to be an exciting forum for discussions about plant signalling. The speakers and posters were of an exceptionally high quality. I had the opportunity to liase with many other scientists, as well as leaders in the field, exchanging ideas on techniques, long term goals regarding plant signalling, and a detailed exchange of project outcomes. A poster was presented reporting the results of the cadinene synthase research and this appeared well received. Many exciting new results were reported at the meeting, particularly those involving trichome (cotton fibre) initiation and development, a rapidly moving research area of which our group at CSIRO Plant Industry has been working on. There were several reports on the

signalling pathways involved in the defense response, mostly using the model plant *Arabidopsis*, where factors involved in the downstream activation of defense genes have been identified and are currently being characterised. Another important field reported was that of transcriptional gene silencing, an area of interest particularly for studying variable gene expression in transgenic plants and the virus-induced gene silencing phenomena.

An assessment of the likely impact of the results and conclusions of the Research project for the Cotton industry, and where possible a statement of the costs and potential benefits to the Australian Cotton Industry and future research needs?

By attending a quality international conference such as the Keystone Symposia, the novel research funded by CRDC is highlighted as relevant and of a high quality. The emerging international sales of CSIRO developed cotton varieties (managed by ACSI) will mean Australian cotton and cotton research will have an increasing international exposure.

A list of publications arising from the research project

Belinda Townsend and Danny Llewellyn (1999) '(+)-δ-Cadinene Synthase Expression Patterns in Bacterial Blight Infected Cotton Cotyledons' *In:* Nam-Hai Chua and Venkatesan Sundaresan, Interactions and Intersections in Plant Signaling Pathways, Coeur d'Alene, Idaho, USA, February 8-14, 1999.