

Program Three

**EDUCATION**



## EDUCATION

### Overview

The third program in the CRC portfolio is Education, designed to enhance the biotechnology and business skills of promising young researchers and increase industry and public awareness of biotechnology opportunities.

The program was administered mainly through The University of Queensland and involved regular interaction with CRC researchers and students, and industry representatives. These interactions allowed us to share our research achievements appropriately with CRC participants and the public.

The first and most important program aim was to educate and train undergraduate and postgraduate students in skills

that will add product value to agricultural export industries. Our activities were tailored to produce CRC SIIB graduates who are familiar with relevant technologies and industry and community perspectives and who understand new and emerging biotechnology industry priorities.

The second aim was to increase industry awareness of available biotechnology opportunities and allied business and technical skills.

We tackled this through the CRC's partners in government, industry and academia, by integrating teaching and training at undergraduate, postgraduate and in-service levels in agricultural biotechnology. The educative focus was on building our intellectual capital so new products could be generated

from sugarcane beyond the CRC's life. Our community communication was the key to developing informed public understanding of beneficial new technologies and a knowledge-based future for the industry.

### 1) Tertiary education and industry interactions

Education and training of students, industry and the community are vital CRC SIIB activities. Through our close links to sugarcane research groups such as BSES Limited, and through a strong communication program, CRC SIIB education has strived to keep industry and community members informed about the latest sugarcane research and its industry applications.



## Program Three (cont'd)

### 2009/10 Highlights

- > As at 30 April 2010, ten students had completed their PhD degrees, two students had completed their Masters degrees, and 14 students had completed their Honours degrees. A total of 41 postgraduate students have worked with the CRC SIIB since 2003.
- > Student training recognition by some industry organisations that have employed our highly-skilled graduates with recently completed qualifications.
- > CRC students' co-authored 33 publications from 1 July 2009 to 30 June 2010, including 10 refereed journal articles.
- > The 'Negotiating for Authorship' workshop, developed in 2007 around CRC's trade mark authororder®, was successfully run at The University of Queensland, Southern Cross University, the University of Western Sydney, the University Putra Malaysia, and at the CRC Association conference's Research Managers' workshop in 2009 and 2010.
- > The 'Authorship News' newsletter, 'Avoid authorship pitfalls with authororder®' Facebook group, 'authororder' Twitter page, and 'I survived the CRC SIIB' Facebook group were launched in 2009 and 2010.
- > Nomination for Cooperative Research Centre Association Award for Excellence in Innovation in Education and Training for the authorship management training program.
- > Suzanne Morris and the authorship management training program were a finalist in UniQuest's Trailblazer 2010 Competition.
- > The sixth CRC SIIB Research Symposium was held in Brisbane.
- > Education staff participated in and gave seminars at major sugarcane industry events to raise awareness of the CRC SIIB's research and biotechnology in general. One paper on the CRC's postgraduate education program and another paper on the CRC's industry biotechnology workshops that were run in 2008/09 were presented at the 2010 ASSCT conference in Bundaberg.
- > CRC SIIB and the ARC Centre of Excellence in Integrative Legume Research (CILR) teamed in July 2009 to run the 'Saving the planet with biotechnology' workshop in UQ's Faculty of Science Experience Science Week. About 30 high school students from South-East QLD participated in the workshop to learn about various aspects of plant biotechnology related to the CRC and CILR.
- > CRC SIIB and the Public Awareness section of the Federal Department of Innovation, Industry, Science and Research staff ran a booth entitled 'Powering Australia's future' at the '2009 Brisbane Ekka'.
- > Education staff participated in the ARC Linkage project 'Research and Innovation Leaders for Industry'.

## 2) Evaluating school education

The long-term aim of this project was to work with, educate and train students in schools and the community about sugarcane biotechnology.

The project achieved its objectives, including the development and implementation of educational strategies and resources for teaching middle and senior phase students about complex issues and concepts associated with the processes and products of biotechnology and increasing students' awareness of biotechnology.

Some of the resources were modified for use by Primary teachers (following professional learning workshops to support their understanding of biotechnology) in several Queensland schools.

Teaching and learning resources include a digital resource toolkit, experimental inquiry activities and teaching support strategies for instruction on biomaterials as well as a web page of resources and an inquiry teaching module with instructional support strategies around the socio-scientific issue 'Should Australia grow GM crops?'.

Our research indicated that our teaching strategies and educational materials promoted student knowledge of biotechnology and scientific literacy. The opportunity for Australian science teachers to learn more about the project was extended through workshops in 2009 where teachers learnt about our project outcomes and associated teaching materials. A range of teacher workshop materials were devised and used to support these professional workshops.



## Student Table

Student Name	Project title	RHD program	Supervisors	CRC project	Stipend	Start Year	University	Graduate destination
Graeme Scheuber	Carbonic anhydrase in sugarcane, isozymes, relative activity and association with sucrose accumulation	Hons	Burnell (JCU)	1a1		2004	JCU	Office of the Government Statistician, Queensland
Lorelene Bowler	Optimisation of in vitro <i>Paenibacillus popilliae</i> sporulation	Hons	Smith, Geijskes (QUT) Nutt (BSES) <sup>†</sup>	1b2		2005	QUT	Research Assistant; BSES
Fabian Tan	Improved production process for <i>Metarhizium anisopliae</i>	Hons	Reid (UQ) Mordocco (BSES)	1b2		2004	UQ	Research Assistant; Institute of Molecular and Cell Biology, Singapore
Ekaterina Nowak	Understand the biology and ecology of sugarcane to manage the safe release of GM cultivars	Masters	Bonnett (CSIRO)	1b5		2006	Griffith	PhD; UQ
Rosanna Powell	Understanding the reproductive biology and ecology of sugarcane to manage the safe release of genetically modified cultivars	Hons	Schmidt (UQ) Bonnett (CSIRO)	1b5		2007	UQ	Research Assistant; BSES
Kerry Vinall	Root traits in the context of nitrogen acquisition in sugarcane	PhD	Schmidt (UQ) Lakshmanan (BSES) Watt (CSIRO)	1b6	APA/CRC top-up	2006	UQ	Research Assistant; UQ
Alexander Whan	Achieving a better understanding of nitrogen efficiency in sugarcane through molecular markers	PhD	Schmidt (UQ) Lakshmanan (BSES) Aitken (CSIRO)	1b6	CRC	2004	UQ	Postdoctoral Research, CSIRO Canberra
Heather Vikstrom	Root traits of sugarcane ( <i>Saccharum</i> ssp.) in context of nitrogen use efficiency	Hons	Schmidt, Robinson (UQ)	1b6		2009	UQ	Research Assistant; BSES
Richard Brackin	Organic nitrogen uptake in sugarcane	Hons	Schmidt (UQ)	1b6		2007	UQ	Research Assistant; UQ
Cassandra Clayton	Identification and development of novel bacterial biocontrol agents	PhD	Smith, Timms, Geijskes (QUT) Nutt, Allsopp (BSES)	1b7	CRC	2005	QUT	Research Officer, bioMérieux Australia Pty. Ltd
Geoffrey Dun	Role of monocot branching genes in sugarcane	PhD	Beveridge (UQ) Hermann, Lakshmanan (BSES)	1b8	CRC	2004	UQ	
Chuong Ngo	Molecular analysis of suckering and tillering in sugarcane	PhD	Beveridge (UQ) Hermann, Lakshmanan (BSES)	1b8	SRDC	2002	UQ	Research Assistant; BSES

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Karno	Physiology of bud outgrowth in sugarcane	PhD	Beveridge (UQ) Bonnett (CSIRO) Lakshmanan (BSES)	1b8	AusAid	2003	UQ	Lecturer; Diponegoro University, Indonesia
Ouzi Amouyal	Sucrose phosphate synthase characterisation and function	PhD	Bundock, Henry (SCU)	1c7	CRC	2004	SCU	Technical Office, SCU
Suzelle Geijskes	Development of a high level expression system for the production of bioplastics in sugarcane	PhD	Dale, Collet (QUT) Lakshmanan (BSES)	2a11	CRC	2004	QUT	Research Assistant; QUT
Lygia Romanach	Understanding knowledge and attitudes to genetic engineering among sugar industry stakeholders based on qualitative and quantitative analysis	PhD	Wegener, Morris (UQ), Grice	2a6	CRC	2005	UQ	
Karl Pioch	Sugar transporters in the tonoplast	PhD	Critchley (UQ) Grof, Rae (CSIRO)	2a7	UQPRS/ CRC top-up	2006	UQ	Postdoctoral Research, University of Cologne
Hayati Iskandar	Expression and function of genes associated with sucrose storage and osmotic stress tolerance in sugarcane stems	PhD	Maclean (UQ) Bonnett, Manners (CSIRO)	2a7	AusAid	2004	UQ	Researcher; Indonesian Biotechnology Research Unit for Estate Crops, Bogor, Indonesia
Mark Jackson	Identification and functional characterisation of genes encoding vacuole-targeted proteins in sugarcane parenchyma	PhD	Maclean (UQ) Rae, Manners, Bonnett (CSIRO)	2a7	CRC	2004	UQ	Postdoctoral Research Fellow; UQ
Kimberly Tilbrook	Production of PHB in the peroxisomes of plants	PhD	Schenk, Brumbley (UQ)	2a8	APA/CRC top-up	2006	UQ	
Kylie O'Keefe	Towards understanding gene silencing of the Cavendish Banana Streak Virus promoter in sugarcane	Hons	Brumbley (UQ)	2a8		2008	QUT	
Lisa Meiers	Towards understanding gene silencing of the Cavendish Banana Streak Virus promoter in sugarcane	Hons	Brumbley (UQ)	2a8		2008	QUT	
Louise Ryan	Towards understanding gene silencing of the Cavendish Banana Streak Virus promoter in sugarcane	Hons	Brumbley (UQ)	2a8		2008	QUT	
Robert Chang	Early screening of transgenic sugarcane	Hons	Lovell, Brumbley (UQ)	2a8		2007	UQ	PhD UQ

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Student Name	Project title	RHD program	Supervisors	CRC project	Stipend	Start Year	University	Graduate destination
Glenn Hassall	Identification of regulatory elements for efficient foreign gene expression in sugarcane plastids	PhD	Collet, Bateson, Geijskes (QUT) Lakshmanan (BSES)	2a9	CRC	2004	QUT	
Noriko Abiko	Expression of transgenes in sugarcane plastids	Hons	Geijskes (QUT)	2a9		2008	QUT	Research Assistant; QUT
Adam Smith	Alternate vectors for plastid transformation	Hons	Geijskes (QUT)	2a9		2007	QUT	
Victor Arias Espana	Clarification of cane juice for polylactic acid production	PhD	Hardin, Do (UQ)	2b10	CRC	2004	UQ	Postdoctoral Research Fellow; UQ
Wendy Chen	Effect of gene dose on hyaluronic acid metabolism	PhD	Nielsen, Hung (UQ)	2b11	CRC	2005	UQ	Postdoctoral Research Fellow; NTU, Singapore
Linda Le	Biotransformation of sucrose using sucrose phosphorylase	Hons	Duggleby (UQ)	2b2		2004	UQ	
Dionne Payn	Phytochemistry of sugarcane	PhD	Leach, Deseo (SCU)	2b3	CRC	2005	SCU	
Rory Taylor	Pharmacology of sugarcane	PhD	Morris, Leach (SCU)	2b3	CRC	2004	SCU	
Colin Archer	Metabolic engineering of E. coli for improved sucrose utilization	PhD	Nielsen, Vickers (UQ)	2b4	CRC	2007	UQ	
Yalun Arifin	Metabolic engineering of sucrose metabolizing E.coli	PhD	Nielsen, Kromer, Vickers (UQ)	2b4	AusAid	2006	UQ	
Jenny Vo	Metabolic engineering of E. coli for organic acids production	Hons	Nielsen (UQ)	2b4		2007	UQ	PhD; UQ
Brian O'Neill	Sugarcane as a biofactory: production of alternative polysaccharides	PhD	Nielsen, Brumbley (UQ)	2b8	CRC	2002	UQ	
Marguerite Renouf	Evaluating the environmental implications of product diversification in the Australian sugar industry	PhD	Pagan, Wegener (UQ)	2b9	APA/CRC top-up	2002	UQ	Lecturer, UQ
Richard Cooper	Doing science artfully: Science as a 3D verb	PhD	Nichols, Renshaw (UQ)	3a4	Griffith	2007	UQ	Researcher, Griffith University
Kalani Eggington	An investigation of teacher-scientist collaborations in a biotechnology context	PhD	Wright, Nichols, Geelan (UQ)	3a4	UQPRS/ CRC top-up	2007	UQ	
Harold Kanasa	Evaluating education and understanding of sugar cane biotechnologies in Queensland middle years classrooms and the community	PhD	Nichols, Geelan, Wright (UQ)	3a4	UQPRS/ CRC top-up	2007	UQ	Research Assistant, Griffith University
Annette Hilton	Digital technologies and multimodal communication in the chemistry classroom	PhD	Nichols, Gitsaki (UQ)	3a4	Ed QLD	2006	UQ	Australian Catholic University, Melbourne

