



# BEANSTALK

Centre for Legumes in Mediterranean Agriculture Newsletter



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## FROM THE DIRECTOR



**Professor**

**Kadambot Siddique**

(ksiddiqu@agric.uwa.edu.au)

We are approaching the end of another exciting and challenging year, during which CLIMA has made good progress in a number of areas.

This year CLIMA received a record \$5.9 million in new funding (21 new projects) for the next three to four years. This is on top of 23 existing projects. Our international and national collaboration strengthened through a number of these projects. CLIMA's research projects are funded largely by the Grains Research and Development Corporation (GRDC), Australian Centre for International Agricultural Research (ACIAR), Rural Industries Research and Development Corporation (RIRDC), the Grains Research Committee (GRC) of WA and the Council of Grain Grower Organisations (COGGO). Recently we have also received two Australian Research Council linkage projects (PhD projects) in collaboration with industry partners (COGGO and DAWA).

Our research focuses on strategic basic and applied research, which underpins the needs of the grain and annual pasture legume industry. During the past two years, we made several scientific advances

and published a significant number of scientific papers (54), invited review articles and book chapters (24) and technical publications (58). This year we organised three successful research workshops (Pasture Legume Research, Introduction to Statistics and Genstat, and Legume Biotechnology). Our fortnightly seminar series coordinated by Dr Jon Clements were well attended and during the year a total of 23 seminars were presented by CLIMA scientists, associates and visiting scientists. CLIMA scientists attended and presented papers at a number of national and international conferences during the year. Several of our scientific colleagues received prestigious awards and fellowships during the year. A number of new post-doctoral fellows and research associates joined CLIMA research projects. CLIMA scientists continued to participate in post-graduate student supervision at UWA and Murdoch University. Three of our post-graduate students were awarded PhD on legume research topics during the year. A number of international and national scientists and several industry and farmer groups visited CLIMA during the past year. A new pasture legume variety (Mauro) was commercially released in collaboration with DAWA and a number of improved grain and pasture legume varieties are in the pipeline. Our contact with the industry strengthened through the CLIMA Industry Advisory Group, recently formed WA Grower Alliance and WANTFA. We also participated in several field days and industry forums. We have

produced and distributed three electronic newsletters during the year. We now have an informative and user friendly Website.

CLIMA has allocated and distributed over \$100,000 core funds to Grain and Pasture Legume Programs for 13 innovative start-up projects that will benefit CLIMA's business. CLIMA also awarded 12 travel top-up awards to our scientists to travel overseas and interstate to participate in various conferences.

CLIMA Research Alliance partners and associates provided strong commitment and support during the past year. The challenge is to lead CLIMA into new directions with continued support from our traditional funding bodies and at the same time develop alliances with new funding organisations including private industry partners.

I am grateful to our support staff, scientists, Governing Board, Industry Advisory Group, funding bodies, numerous international and national collaborators for their hard work, advice and friendship that leads to the continued success of CLIMA Research Alliance.

Best wishes to you and your family for the festive season and I look forward to another challenging and rewarding year.

### CLIMA ASSOCIATES RECOGNISED FOR THEIR CONTRIBUTIONS AND ACHIEVEMENTS

Dr Roger Jones has been nominated as Fellow of the Australian Institute of Agricultural Science (FAIAS). This is a clear recognition of Roger's dedication to virology research, relevant to West Australian agriculture. Roger's work on viruses in lupins has led to the development of rapid seed testing (virus) procedures in WA. His contribution to research on viruses in grain legumes, pasture legumes, oil seed and vegetable crops are well known internationally through his numerous scientific publications.

Dr James Ridsdill-Smith was selected as Fellow of the Academy of Technological Sciences and

Engineering (FTSE) in Sydney this November for his contributions to entomology research. James is very proud of the recognition he received for the work he did together with many of his colleagues at CSIRO and CLIMA. The award reflects the high quality of James' agricultural and entomological research.

Another FTSE nominee is chairman of our Industry Advisory Group, Mr Trevor Flugge. Trevor has been awarded for his contributions to Australian agriculture, especially in developing significant international markets for Australian wheat during his time as chairman of the AWB Pty Ltd. Trevor has also served as a board member and chairman of a number of committees and organisation involved with agricultural research and development.

Recently, Adjunct Professor Neil Turner has been invited to join as a Fellow of the Indian National

Academy of Agricultural Sciences (NAAS). The Academy plays a major role in supporting excellence in agricultural scientific research and promoting contact among researchers of different institutions and organizations in India and abroad. This prestigious award is offered to scientists that have rendered conspicuous service to the cause of science. Only a small number of foreign scientists are invited to join the Academy and it is therefore a great privilege for Professor Turner to be selected. Professor Turner has had a long and productive association with Indian Agriculture through various joint research projects between India and Australia. He has also hosted a number of visiting scientists at CSIRO and CLIMA.

We are very proud of the above well-deserved achievements. Congratulations to Roger, James, Trevor and Neil from CLIMA partners and scientists.

### CLIMA ALLOCATES \$100,000 INTERNAL FUNDS

A total of \$ 100,000 core funds have been allocated to CLIMA project activities in 2002-2003 that will benefit CLIMA research and development. We received a number of innovative proposals and the successful ones are listed below. Congratulations from the CLIMA Program Management Team to the successful applicants!

#### GRAIN LEGUME PROGRAM

	Chief Investigator	Funding (\$)
Microscopic investigation into embryo development in chickpea	Heather Clarke	5,800
Does habitat of origin play a role in determining vernalisation responsiveness and low temperature tolerance at pod set in the genus <i>Cicer</i>	Jens Berger	5,700
Determination of the anti-nutritional nature of yellow lupin kernel meals when fed to fish	Brett Glencross	8,500
Interspecific crossing to develop <i>Lupinus angustifolius</i> , <i>L. luteus</i> and <i>L. albus</i> with seed quality changes	Jon Clements	6,000
Development and evaluation of a 'NBS-FLP' technique for searching molecular markers associated with disease resistance genes in lupin	Hua'an Yang	7,250
Chemical and biochemical mechanism of resistance to fungal diseases in <i>Medicago</i>	Shaofang Wang	8,000

CLIMA allocates \$100,000 internal funds (continued)

### GRAIN LEGUME PROGRAM

Support for Dr Knut Schmidtke to visit CSIRO and CLIMA for 1 year from March 2003 to work on 'Yield formation and water use efficiency of narrow leaved lupin as influenced by water deficits and N source'

Travel support for five postgraduate students to attend the '*Medicago truncatula* genome' conference at Rottneest

### ANNUAL PASTURE LEGUME PROGRAM

Rhizobial support for breeding of forage legumes for Australia by Dr Real in Uruguay

Use of NIR to inexpensively and rapidly predict the quality of legume pastures and fodder

Support for *Trifolium* Genetic Resource Centre

Development of legumes for turf and roadsides

Database development

Cultivation, seed increase of forages for agriculturals

Travel - Bioactive compounds conference, Lorne

Travel - Mediterranean pastures conference, Morocco

Travel - Conference paper presentation, *Trifolium spumosum*, Geelong

Travel - *Medicago truncatula* genome conference, Rottneest

Chief Investigator	Funding (\$)
Neil Turner	6,000
Geoff Dwyer	1,750
Chief Investigator	Funding (\$)
John Howieson	10,000
Hayley Norman and Robyn Dynes	10,000
Richard Snowball	4,000
Richard Snowball	4,000
Richard Snowball	7,000
Kevin Foster	5,000
Shaofang Wang	1,700
Mike Ewing	2,100
Angelo Loi	1,500
Wayne Reeve and John Howieson	1,200

### MAURO: A NEW BISERRULA FOR MEDIUM TO HIGH RAINFALL AREAS

Dr Angelo Loi and Mr Brad Nutt

The potential of biserrula (*Biserrula pelecinus* L.) has not been fully exploited in the southern Australian farming systems. The main reasons are the limited market availability of seed of the only biserrula variety, i.e. Casbah, and the characteristics of the

cultivar itself, which has been selected for low to medium rainfall areas as a self-regenerating pasture legume in intensive cropping systems. Recently, a second biserrula variety, called Mauro, has been developed to exploit the best traits of biserrula in areas with medium to high annual rainfall.

Mauro was collected by Dr Angelo Loi and Dr Claudio Porqueddu in the south-eastern part of Sardinia (Italy) and selected at the University of Western Australia Field Station (Shenton Park) by

Dr Loi during his PhD study (1995-1998). The cultivar was named after Angelo's father, who was an agronomist and helped collect material for Angelo's PhD study before he died in 2002. The Mauro variety has been under national field evaluation from 1998 to 2001 by the National Annual Pasture Legume Improvement Program (NAPLIP) and has proven to be one of the most productive genotypes in WA and NSW.

Mauro: a new biserrula for medium to high rainfall areas (continued)



Dr Angelo Loi (left) and Dr Giovanni Garau (right; University of Sassari, Italy) in Mauro biserrula field.

The advantages of this new cultivar over the Casbah variety are its lower level of hard seed and its comparatively higher regeneration numbers in the second year. Mauro also flowers 2 weeks later than Casbah, which makes it more suitable for use in medium to high rainfall areas (450-700 mm). The more prostrate growth habit and the small seed of Mauro provide very good persistence under both heavy winter and spring grazing. Approximately 40 % of the seed can survive ingestion by sheep therefore that summer grazing is unlikely to harm the stand density or long term persistence. Spring herbage yields of ungrazed Mauro in WA ranged from 3.5 to 5 t/ha (400 mm areas) and from 5 to 9 t/ha in NSW (500 mm areas) which compares favourably with pink serradella, yellow serradella and subterranean clover. Mauro is a prolific seed

producer, with seed yields ranging from 400 kg/ha to 1600 kg/ha, and because of its very small seed size relates to very high seed numbers.

For further information on the new Mauro variety, please contact Dr Angelo Loi ([angeloi@cyllene.uwa.edu.au](mailto:angeloi@cyllene.uwa.edu.au)) on (08) 9285 8079 or Mr Brad Nutt ([bnutt@agric.wa.gov.au](mailto:bnutt@agric.wa.gov.au)) on (08) 9368 3870.

## NEW APPOINTMENTS

### Janine Croser to develop doubled haploids in chickpea and field pea

Dr Janine Croser

Dr Janine Croser is the latest Research Fellow to join the CLIMA team, on a Grains Research and Development Corporation (GRDC) funded project (UWA00035) investigating the development of doubled haploids in chickpea and field pea. This project will collaborate with pulse doubled haploid researchers at the University of Saskatchewan, Canada and the South Australian Research and Development Institute, Adelaide.

The development of homozygous true-breeding individuals is one of the most time consuming aspects of breeding self-fertilising species such as chickpea and field pea, commonly taking approximately six generations. One method of accelerating this process is by utilising haploid plant material. Haploid plants can be produced *in vitro* directly from the male or female gametes without fertilisation. When the chromosome complement in these hemizygous haploids with only one allele

per locus is artificially doubled, they become fertile doubled haploids, which are instantly and completely homozygous at each locus. These doubled haploid plants can then be multiplied and used immediately as varieties or, more commonly, used as inbred material for crossing or molecular mapping programs. Development of doubled haploid populations via anther or microspore culture has found practical application in the breeding of many crop species, especially of the *Gramineae* and *Solanaceae* families, but the technique has yet to be successfully applied to cool season grain legumes. This will be the focus of Janine's three-year project.



Dr Janine Croser and Professor Kadambot Siddique discussing project details.

Janine has gathered a wealth of experience related to doubled haploid research throughout her studies and postdoctoral work. Following an undergraduate degree in Science at Flinders University in Adelaide, she worked for a short time as a cell biologist for Agriculture Victoria (AgVic)

before completing a PhD on ‘haploid and zygotic embryo culture of chickpea (*Cicer arietinum* L.)’ at Melbourne University. She has also undertaken pulse doubled haploid research as a postdoctoral fellow with the Crop Development Centre at the University of Saskatchewan. Her research experience also includes the development of doubled haploids in canola with AgVic, Monsanto Australia and Vanderhave Research, the Netherlands. Janine will be a familiar face to many at CLIMA as she has also worked at CLIMA previously as a Research Officer with Professor Kadambot Siddique. Janine can be contacted on [jcroser@agric.uwa.edu.au](mailto:jcroser@agric.uwa.edu.au) for further information on the project.

## Ping Si joins CLIMA

Dr Ping Si



Dr Ping Si and Professor Kadambot Siddique discussing the new project requirements

Dr Ping Si has taken up a Research Associate position at CLIMA on a Grains Research and Development Corporation (GRDC) funded project. This project, titled “improving lupin tolerance to metribuzin and developing lupin germplasm tolerant to new herbicides”, has two aims. The first aim is to improve tolerance to metribuzin herbicide in future cultivars combined with resistance to diseases. Research activities, commenced in July 2002, have confirmed genotypes differ in tolerance to metribuzin under phytotron conditions. Crosses between tolerant and susceptible genotypes have been made for studies on inheritance of the tolerance. Methods of selection for tolerance within segregating populations will be developed subsequently. The second aim of the project is to develop lupin germplasm with tolerance to new herbicides, which would lead to development of lupin cultivars with robust tolerance to herbicides to combat the herbicide-resistant weeds. Tolerance to new herbicides is expected to be identified through induced mutation and/or screening the diverse lupin germplasm collections available at the Department of Agriculture Western Australia (DAWA). A large quantity of lupin seeds has been treated with chemical mutagens to induce mutation desired in this project. Ping works very closely with Dr Mark Sweetingham and Dr Bevan Buirchell (DAWA) on the above project.

Ping brings many years of plant genetics and breeding experience into the new project. She obtained her PhD in physiological genetics of pre-anthesis growth and development in *Brassica rapa* under the supervision of late Professor Noel

Thurling at UWA. Before taking up her current position in CLIMA, she was a Postdoctoral Fellow at the School of Plant Biology at UWA identifying the oil content determinants of canola in low rainfall areas of WA. Ping actively collaborated with CLIMA when she was working as a subterranean clover breeder with the DAWA in 1994. She enjoys working with the supportive collaborators in the CLIMA Research Alliance. Ping can be contacted on [pingsi@cyllene.uwa.edu.au](mailto:pingsi@cyllene.uwa.edu.au) for further information on the project.

## NEW PhD PROJECT

### Strong Field Peas Fight Fungus - Using recurrent selection to boost polygenic resistance

Mr Cameron Beeck

Late last year, Cameron Beeck started a PhD project on “Rapid recurrent selection to improve resistance to blackspot in peas”. The project is supervised by Dr Janet Wroth and follows on from her PhD project, completed in 1996, which established the polygenic nature of inheritance of disease resistance in pea for *Mycosphaerella pinodes*. Co-supervisors Associate Prof. Wallace Cowling (UWA) and Dr Tanveer Khan (DAWA) bring vast experience in population genetics and field pea breeding respectively.

Field pea has a reputation of being very susceptible to blackspot and having a tendency to lodge due to weak basal stems and high biomass. Only strong prices and the need for an extra legume crop for

the medium to heavy soils has seen its popularity increase in recent years. Black spot has a negative impact on yield and downgrades seed quality due to discoloration.

Blackspot can be caused by three *Ascochyta* pathogens, however, in Australia only one of these, i.e. *Mycosphaerella pinodes*, is considered to be the causative agent. Blackspot behaves like other stubble-borne fungi, remaining dormant on stubble over summer before infecting during the favourable conditions of winter.

Past chemical and cultural control methods have been unsuccessful. Plant breeding attempts to tackle blackspot by developing leafless pea varieties and finding major gene resistance have also had limited to no success. Dr Janet Wroth established in her PhD that blackspot resistance is inherited as a polygenic trait, with variation in resistance in many different wild-type sources of pea. Traditional pedigree breeding systems do not cater for pyramiding many resistance genes from wild germplasm sources, as needed in a polygenic system of resistance.

Cameron's PhD study focuses on using recurrent selection to pyramid resistance genes from a population of parents into ever improving progeny. Parents chosen for the crossing program are from a wide ranging pedigree, including adapted Australian germplasm and exotic material with novel germplasm. Strong agronomic lines from WA, NSW and Victoria, and lines from Dr Janet Wroth's PhD are featured with some exotic material coming from Professor Clive Francis' seed collection trip to the Greek islands.

Additionally, Cameron's project will look at improving stem strength in field pea. The resulting improved plant

morphology may assist disease resistance mechanisms by reducing sub-canopy humidity which is an important factor in the blackspot disease system. A new technique will be used to assess stem strength through physical measures of excised stem sections, as opposed to the subjective field measure of lodging. This will also take into account differences in stem diameter and stem wall thickness. Therefore this project will develop not only improved disease resistant germplasm with increased stem strength, but also new techniques in stem strength measurement. Cameron can be contacted on [cbeeck@agric.uwa.edu.au](mailto:cbeeck@agric.uwa.edu.au) for further information on his project.



*Field pea leaves infected by blackspot*

### VISITORS

Visitor Name	Visiting Period	Institution and Country	Contact Details
Ms Alessia Dinatale Ms Chiara Fedi	Oct 2002 – Jan 03	University of Florence, Italy	Dr Richard Snowball
Prof. Nicolai Dzybenko	20 - 27 Oct 2002	Forages Department, Vavilov Institute, St Petersburg	Prof. Clive Francis
Adj. Prof. Steve Clement	1 Nov 2002	Washington State University and University of Idaho, USA	Dr Jon Clements
Mr Steven Watkins	12 Nov 2002	Nuffield Farming Scholar, UK	Mr Peter Nelson (GPWA)
Dr Kevin McPhee	14 Nov 2002	Department of Crop and Soil Science, Washington State University, USA	Prof. Kadambot Siddique Dr Heather Clarke
Ms Marigo Raftopoulos Mr Ron Storey	18 Nov 2002	GRDC Consultants	Prof. Kadambot Siddique

**CLIMA STUDENTS MOVING ON****Hayley Norman passes PhD with distinction**

Last September, Hayley Norman's PhD thesis was passed and was awarded a distinction (top 5% of theses from UWA). Hayley studied 'the reproductive strategies of annual legumes from Mediterranean-type climates' under the supervision of Professor Phil Cocks and Dr Nick Galwey and with financial support of GRDC. Hayley continues to work as Pasture Ecologist with the Livestock Industry team at CSIRO's Centre for Environment and Life Sciences (Floreat), where she is part of a team investigating animal production from saline land. Hayley maintains her collaboration with CLIMA through legume pasture projects. Congratulations Dr Hayley Norman!



*Dr Hayley Norman looking at a research site at ICARDA in Tel Hadya, Syria.*

**Patrizia Gremigni joins CSIRO Plant Industry**

Just two months after graduating, Dr Patrizia Gremigni has landed a full-time postdoctoral position as Chickpea Physiologist/Biochemist at CSIRO Plant Industry, Perth. The position is for two years, starting on 9 December 2002, under the supervision of Adjunct Prof. Neil Turner (Perth) and Dr Robert Furbank (Canberra). The project will:

- evaluate transgenic chickpeas with enhanced levels of key enzymes in sugar metabolism for growth, seed development and assimilate distribution under adequate- and limited-water regimes and compare their performance with the non-transgenic parents;
- assay enzymes of sugar metabolism and their localisation during seed development in transgenic chickpeas and their parents;
- assist in the development of molecular markers for key enzyme activities during seed development in chickpea.

CLIMA wishes Patrizia a lot of success in her new research position!

**BABY NEWS**

Debbie Thackray and Kevin Murphy became the proud parents to Rebecca Erin Murphy on 16 October 2002, weighing 3.24 kg. Emily is also overjoyed with her new baby sister.

**SEASON'S GREETINGS**

As this is the last newsletter for the year, I would like to thank all of the staff, associates, program management team, Governing Board members and Industry Advisory Group in CLIMA Research Alliance for all their hard work and support in 2002. I wish everyone a happy and safe Christmas and New Year. I look forward to work with you all in 2003.

Professor Kadambot Siddique

### NEWSLETTER CREDITS

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