

The UWA Institute of Agriculture

Number 31, April 2017



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**



DR LEI LI AND PROF HARVEY MILLER DETERMINE HOW MUCH PLANTS NEED TO SPEND ON SPECIFIC PROTEINS.
PHOTO: JAMES CAMPBELL LUCK

Teaching plants to be better spenders

Energy is an all-important currency for plants, and scientists from UWA have now calculated the cost of one of their biggest expenses. The knowledge could be a key to creating more energy efficient crops.

To grow and maintain themselves plants must constantly create new proteins and break down existing ones. The process, called 'protein turnover', uses much of a plant's energy. Armed with a new technique, researchers have determined exactly how much a plant needs to spend on specific proteins.

The knowledge can be used to help plants become better energy spenders.

Dr Lei Li, lead researcher on the study from the ARC Centre of Excellence in Plant Energy Biology said this means they can now measure how long a plant protein lives and how much energy a plant need to spend in order to keep that protein around and functional.

"We've calculated the lifespan of over a thousand proteins and, importantly, the energy investment needed by a plant to maintain each of them," Dr Li said.

"Essentially we've figured out the cost, to a plant, of each protein".

The researchers found that the half-lives of the proteins studied can vary from several hours to several months. This led them to investigate the specific characteristics which determine how quickly a protein is turned over, and how much energy is needed to do it.

The comprehensive study also revealed the features that allow a protein survive longer. This knowledge could be applied to help plants engineer more robust, less energy expensive proteins.

...continued on page 2

Co-researcher Prof Harvey Millar said it's much like spending money on a product you need.

"The best option is to balance between whatever will last you the longest, but cost you the least."
"If we can teach plants how to more wisely use their energy budget to meet requirements and to face environmental challenges then the result will be more energy efficient and productive plants.

"This is particularly valuable for agriculture, where current crop plants are not going to be able to meet future food requirements.

"In a world faced with increasing populations and limited land for agriculture, more energy efficient plants are necessary to feed us into the future."

The study was published in the journal *The Plant Cell*.

Director's Column

Hackett Professor Kadambot Siddique
AM CitWA FTSE FAIA FNAAS FISPP
kadambot.siddique@uwa.edu.au

This year has started with some positive changes for The University of Western Australia and agriculture. Firstly, we welcome Professor Dawn Freshwater, who was appointed UWA's 18th Vice Chancellor. Previously the Senior Deputy Vice Chancellor, Professor Freshwater led the university through a transformation strategy and restructure, to ensure it runs efficiently towards the goal of being a top 50 university by 2050. She has clear vision, passion and commitment to ensuring the University makes a positive impact on as many people as possible.

In the new structure, there are four faculties – the Faculty of Science, Faculty of Health and Medical Sciences, Faculty of Arts, Business and Law, and the Faculty of Engineering and Mathematical Sciences. The UWA Institute of Agriculture (IOA) will continue to collaborate across the four faculties, especially the new schools of Agriculture and Environment, Biological Sciences and Molecular Sciences, in the Science Faculty.

The IOA Industry Advisory Board met at the end of March, and I was pleased to see full attendance and strong support from all 12 Board members. The Board remains very engaged in providing input to the work of IOA, recognising the need to maintain a high degree of academic endeavour, and retain strong links to the agricultural sector.

Each year the Industry Advisory Board steers a half day forum on a topical agricultural theme. This year's industry forum ***Consolidation in Agriculture: impacts to farm, research and agribusiness*** is scheduled for Tuesday, 18 July at the University Club of WA and will no doubt stimulate some interesting discussions.

Another key event to mark in your calendar is the annual Postgraduate Showcase: Frontiers in Agriculture on Wednesday, 7 June in the Bayliss Lecture Theatre at UWA. The Postgraduate Showcase brings together some of UWA's best PhD students



at an advanced stage of their research. It highlights relevant research and progress being made in the area of agriculture, food science and related natural resource management at UWA.

Five PhD students from UWA undertaking grains related research received scholarships from the Australian Grains Institute's Capacity Building Project, Careers in Grain to attend the GRDC Grains Research Update, Perth. UWA was well represented with several academics and students presenting their research at the event (see page 4).

UWA's collaboration with University of Agriculture Faisalabad (UAF), Pakistan is progressing well, with six new PhD students commencing their studies at UWA in agriculture and related areas this year.

Continuing on the international front, a UWA delegation visited Japan earlier this year and discussed a number of collaborations, and opportunities to provide postgraduate training, research and joint PhD programs with Nagoya University (see page 6). A group also represented UWA at the 5th Interdrought Conference in India (see page 10), and at the 2nd Elsevier Conference on Agriculture and Climate Change (see page 16). These meetings help UWA maintain its position as a world leader in agriculture, and achieve its vision of being a top 50 university by 2050.

Finally, Ms Brenda Dagnall has joined the IOA team as Personal Assistant to the Director. Previously Brenda was Executive Assistant to the Director of the International Centre for Radio Astronomy Research and is familiar with UWA and its processes. Please make her feel welcome.



DR SUSAN BAILEY EXPLORES THE IMPORTANCE OF A WELCOME TO COUNTRY WITH PINGELLY ABORIGINAL ELDER, MR MERVYN ABRAHAM. MICHELLE BUNTING (CENTRE OF EDUCATION FUTURES) IS FILMING THE DISCUSSION

Best-Practice Farming course for a Sustainable 2050 delivered online

Debra Mullan
debra.mullan@uwa.edu.au

Anyone interested in learning the key principles of best-practice farming will soon be able to do so by enrolling in the MOOC *Discover best-practice farming for a sustainable 2050*.

A MOOC is a massive open online course, where participants can enrol in a course for free and have unlimited open access to learning via the web. Participants can obtain certification for the course completed if they wish.

The course is funded through UWA's Centre of Education Futures, and is based on the vision of the Future Farm 2050 (FF2050) Project, which aims to develop the best-practice farm for 2050, start to transform UWA Farm Ridgefield now, and show that it is profitable.

Over seven weeks, the MOOC will guide participants on the key areas towards sustainable farming including soils and water management, cropping including weed management and plant breeding, versatile livestock management, biodiversity, rural infrastructure and vibrant, healthy rural communities.

Participants from around the world will be able to navigate UWA Farm Ridgefield in virtual 360-degree vision, getting a true sense of the Australian landscapes and farming environments. The course is scheduled to begin in the first half of this year.

UWA Farm Ridgefield helps combat rabbit threat in Australia

Debra Mullan
debra.mullan@uwa.edu.au

UWA Farm Ridgefield is taking part in the RHD Boost research initiative, a national project to help combat the threat of rabbits within Australia.

The national release of RHDV1 K5, a Korean strain of Rabbit Haemorrhagic Disease Virus took place in March to investigate the geographic distribution and genetic diversity of the biocontrol. This is the first time in 20 years that a new rabbit biocontrol agent has been released in Australia.

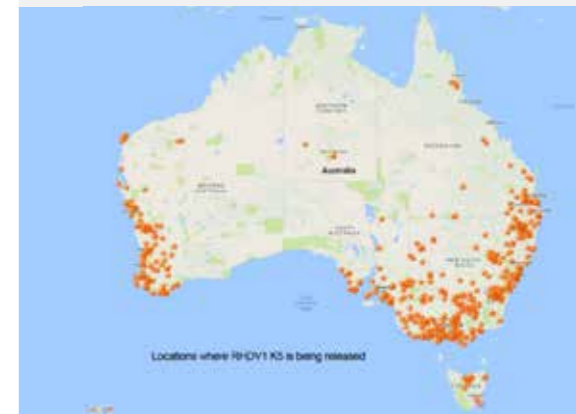
Mr Steve Wainewright, Farm Manager, UWA Farm Ridgefield identified an area on the farm affected by rabbits and estimated the current population prior to the release of the virus.

Baits containing the virus were distributed and disease-affected rabbits identified in the area were reported to the Invasive Animals CRC.

The improved understanding will help enhance rabbit biocontrol effectiveness and allow more efficient RHDV delivery systems to be developed and ensure best management outcomes.

The initiative is only one part of the picture and UWA Farm Ridgefield will integrate the release of RHDV1 K5 with additional control measures to form a multi-pronged approach to rabbit control on the farm.

For more information on the RHDV1 K5 release visit the PestSmart website pestsmart.org.au/boosting-rabbit-biocontrol-rhdv-k5-national-release



LOCATIONS OF SITES THAT REGISTERED TO RELEASE RHDV1 K5. PHOTO: PETER WEST, INVASIVE ANIMAL CRC

GRDC Grains Research Update, Perth

Diana Boykett
diana.boykett@uwa.edu.au

UWA was well represented at the 2017 Grains Research Update, Perth held at Crown Perth, Burswood on 27 -28 February 2017. The two-day program showcased the latest research, technology, market development and management innovations to improve the productivity of the WA grains industry.

Five UWA students Ms Candy Taylor, Mr Nathan Craig, Mr Yaseen Khalil, Ms Ly Le and Mr Enoch Wong were awarded scholarships from the Australian Grains Innovation Capacity Building Project to attend the event, as part of their Careers in Grain initiative.

One of the scholarship recipients PhD Candidate Yaseen Khalil, gave an engaging presentation on his research into the effect of crop residue and rainfall on the availability of pre-emergent herbicides in the soil, which was very well received by the industry.

He looked at three herbicides trifluralin, pyroxasulfone and prosulfocarb and

how they are leached from crop residues depending on the rainfall amount, intensity and timing.

The results showed that crop residues intercept herbicides during application. Some of the herbicide washed off the residue with as little as 10-20mm of rainfall. The sooner the rainfall occurred the greater the amount of herbicide leached. However, the intensity of rainfall had no effect. Multiple rainfall events of 5mm over two days leached less intercepted herbicide off wheat residue than a single event.

Interestingly, more herbicide was retained on crop residue after rainfall, when the chemicals were applied to initially wet residue, rather than dry residue. When assessing the herbicide availability in the soil underneath the wheat residue, wet residue was intercepting significantly more herbicides comparing to the dry one. More wheat residue presence on soil surface, intercepted more herbicide and stopped them from reaching soil surface.

Other presenters from UWA were Prof Martin Barbetti, Dr Roberto Busi, Mr Nathan Craig and Dr Dusty Severtson, DAFWA.



PHD CANDIDATE YASEEN KHALIL WAS ONE OF FIVE UWA STUDENTS TO RECEIVE THE CAREERS IN GRAIN SCHOLARSHIP

Getting something for nothing with smart surveillance

Designing smarter biosecurity surveillance systems to detect grape phylloxera in grapevines and fruit fly in fruit growing areas will lead to more effective and economical detection for industry in combatting these costly pests.

By applying statistically-based surveillance systems that account for organism biology, trap or sampling efficacy and landscape characteristics, those involved in surveillance, such as government regulators, industry bodies or even individual growers, can maximise the efficiency and effectiveness of surveillance design.

Current surveillance practices for phylloxera and fruit fly include sampling at set intervals along vine rows and in grid patterns across the landscape.

Researchers have found that by targeting surveillance sampling towards highly-suitable soils in vineyards they could significantly improve the speed of detection and minimise the pre-detection spread of a new phylloxera incursion.

When it comes to fruit fly, by targeting high risk introduction sites and areas with a high fruit tree density they could also improve detection to minimise the impact or spread of an incursion.

In both cases, the results indicate that by being smart about spatially-targeted surveillance the grower or industry gets 'something for nothing' – that is, better surveillance outcomes for the same amount of effort and resources.

This CRC project is being led by Dr Michael Renton from UWA's School of



PBCRC PROJECT LEADER MICHAEL RENTON INSPECTS GRAPEVINE ROOTS FOR GRAPE PHYLLOXERA

Biological Sciences in collaboration with Vinehealth Australia, Department of Agriculture and Food WA, Victorian Department of Economic Development, Jobs, Transport and Resources and Plant & Food Research in New Zealand.

This article was first published by PB CRC.

UWA Graduate wins 2017 Seed of Light Award

UWA graduate Dr Stephen Davies was named winner of the 2017 GRDC western region Seed of Light award.

The Seed of Light award is presented annually to a person making a major contribution to communicating the outcomes of grains research and development in WA.

Dr Davies, a research officer at the Department of Agriculture and Food WA received the award for his research into delivering practical agronomic solutions for water repellent soils in WA.

Western Regional Panel Chairman Peter Roberts who presented the award said the work led by Dr Davies was starting

to pay off in the development of tools for more effective soils and agronomy management to reduce production risks and lift returns.

"Dr Davies has demonstrated outstanding leadership and use of innovation and creativity in his scientific endeavours in this field," he said.

"Many growers across the grainbelt have now adopted some form of soil amelioration techniques and are reaping the benefits of potentially higher-yielding crops that can tap into extra soil moisture at seeding and other key times of the growing season."

Dr Davies completed his PhD at UWA in 1999 on Seed growth and assimilate

remobilisation in chickpea as affected by water deficit. He was supervised by Adjunct Prof Neil Turner, Prof Kadambot Siddique and Assoc/Prof Julie Plummer. Dr Davies' PhD research was supported by GRDC.



GRDC WESTERN REGIONAL PANEL CHAIRMAN PETER ROBERTS, STEPHEN DAVIES (DAFWA) AND GRDC CHAIRMAN JOHN WOODS. PHOTO: GRDC



MR KIM CHANCE WITH HIS CAMELS. PHOTO: ROBERT KOENIG-LUCK

Obituary – Mr Kim Chance

Former WA Labor Agricultural Minister Kim Chance passed away on 22 February 2017. He was 70 years old.

Mr Chance was a member of the Legislative Council, representing the agricultural region from 1992 to 2009, and served as Minister for Agriculture between 2001 and 2008.

He was a strong supporter and regular visitor to IOA and officially opened the institute when it was re-established in 2007. One of Mr Chance's latest projects was Dandaragan Camel Dairies, Australia's biggest commercial camel dairy.

Mr Chance will be sadly missed by all at UWA.

Links with Nagoya University continue to grow

Professor Tim Colmer
timothy.colmer@uwa.edu.au

UWA and Nagoya University (NU) are working towards establishment of a joint PhD degree, for students with research on topics in agricultural science and related disciplines.

Establishment of a joint PhD degree by a Japanese university requires a detailed proposal submission to the relevant government department for approval – quite an investment but with great opportunities for research student training and increased research collaborations between the partners.

UWA and NU held two joint scientific workshops during 2016 to explore common and complementary research interests to ensure a firm basis for the proposed joint PhD degree. These workshops, held at UWA, have already resulted in the commencement of new research collaborations, detailed planning for the joint PhD degree, and new friendships.

In March 2017, a UWA Faculty of Science delegation visited NU for a third workshop, enabling a greater number of NU staff and students (including MSc students as prospective intake to the joint PhD degree) to learn about UWA and some of our research.

The delegation, led by Pro-Vice Chancellor and Executive Dean of Science Professor Tony O'Donnell, included Profs Kadambot Siddique, Graeme Martin, Tim Colmer, and Ms Annabel Turner. Presentations were given also by NU staff, and together the topics were wide-ranging: soil microbiology, plant physiology, crop breeding, animal reproductive physiology, and 'clean, green and ethical animal production'.



THE UWA TEAM WERE HIGHLY IMPRESSED BY THE FACILITIES AND SCIENCE AT NU, AND THE ENTHUSIASTIC AND FRIENDLY STAFF AND STUDENTS

New collaborations should emerge from the discussions held during the workshop and subsequent laboratory visits. The UWA team were highly impressed by the facilities and science at NU, and the enthusiastic and friendly staff and students.

Our discussions included undergraduate study abroad opportunities, including the generous help by UWA's School of Physics to extend their New Colombo Plan Government of Australia grant for physics students to visit NU, to include also students in agricultural science.

Some undergraduates from NU have also already visited UWA, and MSc students at NU expressed interest in participation in UWA's International Research Training Program run by the International Office and recently opened also to students at NU as a priority partner.

Opportunities for staff research visits were also highlighted. The developing depth of relationship between our two 'Top 100' universities, will certainly

underpin a successful joint PhD program for students in various disciplines contributing to agricultural science. The joint PhD degree proposal will be submitted to the Government of Japan towards the end of 2017. In the meantime, we plan to continue existing collaborations and commence new joint research projects.

Following the Nagoya program UWA delegation visited Tokyo University of Agriculture (TUA), Tokyo NODAI and participated in a joint workshop. While at TUA, the UWA delegation discussed the ongoing student exchange program, and potential areas of research collaboration.

In Tokyo, the UWA delegation also visited the Australian Embassy and met with His Excellency Ambassador Richard Court AC and his staff. The Ambassador was pleased to hear about the focussed collaborations UWA has made in Japan and offered all necessary assistance from the Australian Embassy



DR KEN FLOWER GUIDES STUDENTS THROUGH THE WANTFA LONG-TERM NO TILLAGE TRIAL

IOA hosts master students from the International Water Centre

Prof Susana Neto
susana.neto@netcabo.pt

IOA recently hosted students from the 2016 Class of the Brisbane-based International Water Centre Master of Integrated Water Management studying Water and Agricultural Landscapes.

The module is coordinated each year by IOA members Adj/Prof Jeff Camkin and Prof Susana Neto and delivered through an intensive eight-day session based at the UWA's Crawley Campus.

The students learn through an innovative methodology that adapts the philosophy of co-learning to the needs of each participant, framed around their individual background, education and professional experience, and personal learning objectives.

Fourteen participants from Australia, Brazil, Chile, New Zealand and the US were welcomed to UWA by the UWA Pro Vice-Chancellor (Research) Prof Peter Davies and heard from academics and practitioners highly regarded in water and agricultural landscapes, including, Hackett Prof Kadambot Siddique, Mr John Ruprecht, Executive Director of Irrigated Agriculture at the Department of Agriculture and Food, WA, A/Prof Ed Barrett-Lennard, Mr Rob Karelse, Western Australia Department of Water; and Dr Ken Flower.

The week included two full-day field trips, firstly to the Gnangara Mound, where students travelled with staff from the Department of Water visiting farms in Perth's peri-urban area and explored the complex water and land management challenges of the Gnangara mound,

including climate change, population growth, increasing competition between agriculture, public and private water supply, and the maintenance of groundwater dependent ecosystems.

The second field trip was to Cunderdin in the grainbelt, where A/Prof Ed-Barrett-Lennard and Dr Ken Flower guided the participants on the visit to the WA No-Tillage Farmers Association long-term no tillage trial to study the methods to improve soil organic carbon, water use efficiency, crop yield and profitability in a low rainfall environment.

On the final day, each participant gave a presentation on their learning journey throughout the week, highlighting how they intended to use the learnings in the module's final essay, the Master course and their future careers. Participants and the module coordinators, Profs Susana Neto and Jeff Camkin, also shared their reflections on this truly intensive, but highly enjoyable week.

More details on the Water and Agricultural Landscapes module is available at <http://watercentre.org/education/programs/attachments/miwm-syllabus/syllabus-water-and-agricultural-landscapes> and more about the IWC Master Course can be found at <http://watercentre.org/education/programs>.



ROSE POSNER (CENTRE) AND FAMILY ON HER 90TH BIRTHDAY

VALE ROSE POSNER

20 January 1923 – 21 January 2017

Mrs Rose Posner passed away peacefully at Newmans on the Park, Templestowe, Victoria on 21 January 2017, a day after her 94th birthday.

Rose was married to the late Professor Alan Posner who was a world leading soil chemist in UWA's then Department of Soil Science and Plant Nutrition. After his death, Rose set up the Alan Meyer Posner Memorial Prize at UWA, which currently goes to an outstanding student studying the third year unit Land Use and Management.

Bewety and the Feast



DR TONY SCHLINK TALKS ABOUT HOW GENETIC SELECTION CAN HELP RESOLVE FLYSTRIKE

Prof Graeme Martin
graeme.martin@uwa.edu.au

The Sheep Industry Research Open Day Bewety and the Feast was hosted by the Department of Agriculture and Food's (DAFWA) Katanning Research Facility on Thursday, 30 March. On show was the latest innovative technology and research across the WA sheep industry and what this means for sheep producers.

Almost 200 people attended the event, about two-thirds being producers.

Representing UWA were Dr Tony Schlink, Prof Graeme Martin and Prof Philip Vercoe from the School of Agriculture and Environment and IOA.

The Australian sheep industry loses \$600m pa because gastro-intestinal worms reduce productivity and also cause diarrhoea that attracts blowflies, leading to flystrike. To make matters

worse, the worms develop resistance to drenches and the use of mulesing to avoid flystrike is no longer acceptable.

Tony's presentation Can you identify breech strike susceptible sheep BEFORE they are struck and Prof Graeme Martin discussed the collaboration between DAFWA and UWA to solve the winter dag problem.

Dr Johan Greeff and Dr John Karlsson of DAFWA tackled the problem by breeding sheep that are resistant to worms. DAFWA and UWA have now joined forces, and also set up a partnership with Curtin University, to take the next step towards realisation of the project goals and uptake of the technology by industry.

Breeding worm-resistant sheep is very effective, but some resistant animals still develop diarrhoea because they have an allergic reaction ('hypersensitivity') to the small numbers of worms that persist in their gut. The plan is to look into the

immune system of the sheep and find the cells, molecules and genes that cause the allergic response. Hypersensitive animals will then be identifiable early in life, and bred simultaneously for resistance to both worms and diarrhoea.

Prof Philip Vercoe gave the good gas on methane with a live demonstration of gas measures. He talked about how to get sheep and cattle to capture more energy in feed rather than wasting it as methane.

The Sheep Industry Open Day was made possible by DAFWA's Sheep Industry Business Innovation project funded by Royalties for Regions, and in partnership with the Sheep Alliance of WA.

Sustainable agriculture depends on people as well as technology

Professor Graeme Martin
graeme.martin@uwa.edu.au

Professor Graeme Martin attended the Association of Academics and Societies of Sciences in Asia (AASSA) Regional Workshop on Role of Science for Inclusive Society. The workshop was held in Tokyo, Japan from 1 – 3 March 2017 and was attended by participants from a wide variety of countries including Russia, Turkey, Malaysia, Indonesia, China, Sri Lanka, Pakistan, Korea, Kyrgyz Republic and Australia.

In the session on Sustainable Future Farm 2050, Prof Martin presented on the Future Farm 2050 Project – Sustainable Agriculture Depends on People as well as Technology, a topic co-authored with Adjunct Senior Lecturer, Dr Susan Bailey.

He outlined the Future Farm 2050 Project focusing on Dr Bailey's work on the 'people enterprise' of the project. Global farming communities are confronted with massive external issues such as climate change, carbon emissions, ecosystem degradation, and animal welfare, and they may be poorly equipped to respond.

These challenges require trans-disciplinary responses, as embodied in 'eco-social work'. Eco-social workers attend to both social and ecological needs and begin by building and nurturing relationships. For the Future Farm 2050 Project, this has included relationships between UWA and rural community leaders, including indigenous elders. Dr Bailey's research found that rural communities are resilient and that the people are responding in innovative ways to the external pressures.

Universities like UWA are conducting research that is vital for rural communities, such as research on aging, responding to indigenous suicide, new agricultural technologies and the list goes on, yet the work is largely hidden from them. The research needs to be shared with rural communities to make lives better.

Other topics in the AASSA session included: technologies for smart farming; risks to agricultural productivity from bans on pesticide use; precision livestock and aquaculture management technologies; community-based approaches by ICT-using farmers; integrated waste recycling systems.



PROF MARTIN WITH PROF ICHIRO UYEDA, VICE PRESIDENT, HOKKAIDO UNIVERSITY WHO CHAIRED THE SESSION ON SUSTAINABLE FUTURE FARM 2050

Australian Wool Education Trust Scholarship for UWA MSc Agriculture Student

Prof William Erskine
william.erskine@uwa.edu.au

The Australian Wool Education Trust (AWET) has awarded Ms Hediye Tahghighi a Masters Scholarship for 2017.

Hediye moved to Perth from Iran in 2016 to complete a Master of Agricultural Science at UWA. For her research, Hediye is studying toxicity tolerance in subterranean clover as a model to link molecular pathways with genetic diversity. Subterranean clover is the most important legume pasture for sheep in Australia.

Hediye is supervised by Dr Parwinder Kaur, Dr Rick Bennett, Dr Maria Pavos-Navarro and Prof William Erskine and she hopes to complete her degree at the end of this year.



HEDIYEH IS GROWING A DIVERSITY PANEL OF CLOVER UNDER CONTROLLED CONDITIONS WHICH SHE SCORES FOR SYMPTOMS



900 PARTICIPANTS FROM 56 COUNTRIES ATTENDED THE INTERDROUGHT – V CONFERENCE IN INDIA

Global drought researchers meet in India

Adj/Prof Neil Turner
neil.turner@uwa.edu.au

IOA Adjunct Professors Neil Turner and Jairo Palta, and Professors Kadambot Siddique, David Edward and Jacqui Batley attended the Fifth InterDrought conference held in Hyderabad, India from 21-27 February 2017.

Organised by Professor Rajeev Varshney from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and UWA, the conference brought together over 900 scientists and students from 56 countries to hear 23 invited and 26 contributory oral presentations across eight plenary sessions, and over 500 poster presentations.

The conference brought together scientists working on all aspects

of drought from climate change to agronomy to modelling to genetics to breeding to molecular biology of crops.

Significant progress has been made since the last InterDrought-IV conference held in Perth in 2013. In particular, areas of modelling the benefits of genetic traits, rapid phenotyping platforms and whole genome analysis for drought traits and the release of a drought-resistant hybrids and open pollinated maize cultivars by the large breeding companies have advanced.

Profs Turner, Palta and Siddique chaired sessions and Prof Siddique presented on 'Characterising root trait variability in chickpea (*Cicer arietinum* L.) germplasm for adaptation to dryland environments'.

Prof Siddique also participated in a lively panel discussion on 'Climate

Smart Agriculture' organised by Dr R.S. Paroda, President of the Indian Society of Plant Genetic Resources and David Bergvinson, Director General of ICRISAT.

Profs Edwards and Varshney organised a workshop on 'Next generation genomics and molecular breeding platform' which was well attended.

Whilst in India, Profs Siddique, Turner and Palta discussed collaborative research and training opportunities between UWA and Acharya N. G. Ranga Agricultural University (ANGRAU) in Andhra Pradesh. Areas identified include (i) drought mitigation, conservation agriculture and breeding for drought resistance; (ii) Remote sensing and GIS studies for water availability in farm ponds and nutrient status; (iii) catchment hydrology and salt water incursion into coastal soils; and (iv) genome editing in chickpea and black gram (with ICRISAT).

New honey bee research centre to create a buzz



A new Cooperative Research Centre (CRC) led by UWA will provide a much-needed boost to Australia's valuable, but largely untapped honey bee products, by bringing together both industry and academic expertise from across Australia.

Dr Liz Barbour, from UWA's Office of Research Enterprise, said the CRC for Honey Bee Products would resolve current industry problems that limited the value and expansion of the Australian honey bee products industry. Products include honey, beeswax, pollen, royal jelly, venom and honey bee export.

"At present, honey bee product value is estimated at \$125 million," Dr Barbour said.

"What is often overlooked is that 44 of our food crops wholly or in part rely on honey bee pollination which adds an additional farm gate value of \$6.5 billion. With the new Australian focus of fine food export, healthy bees are an essential ingredient for success."

"The low price of most honey bee products from Australia doesn't reflect their unique and pure qualities,"

"Australia, especially Western Australia, has one of the healthiest honey bee populations in the world so no antibiotics or chemicals from bee

husbandry contaminate the products. Whilst Australia is surrounded by bee diseases, through our quarantine efforts, the worst (including the sucking mite, Varroa) have not yet reached our shores."

Bee disease is a big threat to Australia's agricultural production.

"If a major bee disease arrived in Australia, there would be a 26 per cent decline in national agricultural production, which equates to a consumer surplus loss of between \$12.4 billion and \$27.2 billion," Dr Barbour said.

Australia currently has 500,000 bee hives but needs 750,000 to qualify for pollination service security. Dr Barbour said the CRC for Honey Bee Products would provide pollination security by increasing the value of the industry to attract and train new professional beekeepers and increase the number of hives.

The marketing success of New Zealand's Manuka honey from a *Leptospermum* species is an approach that will be pursued within this CRC. Whilst New Zealand has one *Leptospermum* species, in Australia we have an additional 80 others. Already Dr Peter Brook's research team from the University of the Sunshine Coast, as part of a larger Rural Industries Research and Development Corporation project, has identified unique Australian Manuka honeys that will be further developed within this CRC. This, together with other Australian endemic flora, opens many opportunities to add value to the honey bee products, and create new hive sites.

"Honey bee product value and production is directly related to the quality and extent of hive sites," Dr Barbour said.

"Through gathering critical data, using GIS (a computer system used to capture and display data) and economic expertise, the CRC will value hive sites for both product quality and impact on bee health." This information will develop a 'bee credit' which in unison with the 'carbon credit' will give new found value to native bush sites and support their conservation.

"New product management systems from site to product, will equip a new era of high value beekeeping," Dr Barbour said.

The CRC will align with Australia's 'clean and green' marketing focus and will be supported by the development of a chain of custody from bush to product that becomes core to the training and education of stakeholders to protect the brand. Documentation of procedures together with nationally approved chemical and anti-microbial property analyses at critical stages will provide assurance of purity and product health activity.

Dr Barbour said honey bee disease-resistance is a complex issue.

"Claims have been made that Australia's honey bee population has little resistance to foreign diseases. If true, any disease invasion would be catastrophic," she said.

The CRC will develop a research network with the US, China and Europe so that international research identifying bee disease genetic markers can be integrated into the Australian honey bee population. This together with providing bee health resilience will provide a bee disease insurance policy to address this major global threat to the industry.

Over 150kg of pulses donated to feed the needy

UWA staff, students and friends have donated over 150 kilograms of pulses for Foodbank WA to provide nutritious meals to struggling Australians.

IOA held the food drive to celebrate Global Pulse Day on 18 January 2017. It was one of 225 events held across 63 countries as one of the final celebrations of the 2016 UN International Year of Pulses, to successfully raise awareness on the multiple benefits of consuming pulses for people and the planet.

Recent research suggests that consuming 20 to 40g of grain legumes per day contributes to reduced risk of mortality because of their benefits against major non-communicable diseases and their risk factors, including cardiovascular disease, diabetes, cancer, obesity and gut health.

They also provide an unparalleled solution to food and nutritional security because of their inherent capacity for symbiotic atmospheric nitrogen fixation, which provides economically sustainable advantages for farming.

Congratulations to all who contributed, especially Mr Jeremy Smith, Administrative Officer at UWA's Faculty of Science for his help with the collection.



IOA COMMUNICATIONS OFFICER DIANA BOYKETT HANDS OVER 151KG OF PULSES TO FOODBANK WA

Specialist AG students from Kelmscott SHS visit UWA

Diana Boykett
diana.boykett@uwa.edu.au

A group of 26 Year Ten students enrolled in Kelmscott Senior High School's specialist agriculture program visited UWA on 23 March 2017.

Professor Graeme Martin from the School of Agriculture and Environment and IOA gave the students a tour of the campus and shared the vision for the Future Farm 2050 Project. Then, Dr

Louise Barton co-ordinator of the Agricultural Science Major gave a brief overview of what the pre-requisites of the course are, and what core and elective units they might take would be once enrolled in agricultural science at UWA.

PhD Candidate Candy Taylor who is researching flowering times of lupins gave the visitors a tour of the glasshouses and led them through an activity of cross-pollinating lupin flowers.

After lunch, undergraduate agricultural science student Madison Voak who studied at Kelmscott Senior High School joined the school students at Prescott Court answered further questions about transitioning to university.

Kelmscott Senior High School is planning to visit UWA Farm Ridgefield in Pingelly later in the year.



UNDERGRADUATE STUDENT MADISON VOAK, A KELMSCOTT ALUMNI INTERACTS WITH THE STUDENTS



PHD CANDIDATE MYRTILLE LACOSTE

UWA Agriculture PhD Candidate at the Commonwealth Science Conference

Myrtille Lacoste
myrtille.lacoste@uwa.edu.au

PhD candidate Myrtille Lacoste from the School of Agriculture and Environment and IOA has been awarded a grant by the Royal Society (London) to attend this year's Commonwealth Science Conference in Singapore.

Myrtille was one of only two successful nominees by the Australian Academy of Science nationally, and the only nomination in the area of agricultural sciences. It was a highly competitive application process with over 900 applicants, 184 who were nominated PhD students. Overall, 217 places have been offered, including 73 PhD students.

Myrtille was awarded the grant based on the quality of her PhD research into comparative agriculture, and her ability to develop new collaborative relationships. Also part of the criteria was the motivation to introduce the novel discipline to Australia and contribute to farming system research.

Comparative agriculture is a discipline which emphasises landscape analysis, and can answer practical gaps that are not captured by the mainstream methods currently used by scientists and other agricultural professionals. Her research has identified and established complex relationships within the farming system, some of which challenge common assumptions.

Young agriculture professionals impress prospective employers

Ms Charlotte Jones from UWA has won top honours at the annual Young Professionals in Agriculture Forum held at Technology Park, Bentley on 30 March 2017, for her presentation on research into links between ecological restoration and human health.

Charlotte was among three finalists, selected to submit a research paper and deliver a presentation of their tertiary studies on an issue impacting agriculture or natural resource management.

Presented by the Department of Agriculture and Food and the WA Division of Ag Institute Australia, the annual forum provides an opportunity to recognise outstanding students who have completed an undergraduate degree at a Western Australian university.

Charlotte presented her research on the links between ecological restoration and human health and whether the vital ecosystem service of disease regulation can be restored through restoration interventions.

Awarded second place was Curtin University of Technology student Virginia Wainaina, from Karawara, who shared her research and Madison Roberts, UWA was awarded third place and also best presentation.

Department acting director general Mark Webb congratulated the all-female finalists on the high quality of their research and presentations, and predicted promising futures for them in the agriculture and food sector.

“Prospective employers in the sector had an opportunity to hear a diverse range of research presented by outstanding finalists, reflecting a high standard of professionals entering the agriculture and food sector,” Mr Webb said.

“The agriculture and food natural resource management sectors provide diverse career opportunities for talented graduates entering the workforce, with growing demand for Western Australia’s agrifood products.”

Charlotte will represent Western Australia in the National Student Forum being conducted by the Ag Institute of Australia in May 2017 in Manjimup.



UWA'S CHARLOTTE JONES WINS TOP HONOURS IN YOUNG PROFESSIONALS IN AGRICULTURE FORUM

Collaborative research project between UWA and Luxembourg Institute of Science and Technology

Adjunct Prof Keith Smettem
Keith.smettem@uwa.edu.au

Dr Julian Klaus from the Catchment and Eco-Hydrology Research group at the Luxembourg Institute of Science and Technology is visiting IOA for two months. The framework of the visit is an international collaboration project with Adjunct Professor Keith Smettem funded by the Luxembourgish Science Foundation.

The research focusses on travel times and dispersion of solutes moving through stream environments, including the hyporheic zone and/or in-channel dead zones, which remains a major challenge in catchment ecohydrology.

One major goal of this collaborative work is the testing of a new network array of potentiometric sensors for chloride transport in different stream environments in Luxembourg and Western Australia. Such sensors can provide measurements at unprecedented spatial and temporal resolutions.

Eventually this will provide a better understanding of instream processes that control the fate and transport of chemicals in the environment. The sensors can also be used in soils for enhanced management of irrigation using brackish water.



DR JULIAN KLAUS TEST POTENTIOMETRIC SENSORS FOR CHLORIDE TRANSPORT IN DIFFERENT STREAM ENVIRONMENTS

John Dillon Fellow visits UWA



DR JULIANO OF THE PHILIPPINE RICE RESEARCH INSTITUTE IN FRONT OF SOME OF THE LARGE XANTHORRHOEAS AT UWA FARM RIDGEFIELD. SHE WAS INSPECTING THE ECOSYSTEM RESTORATION SITE AND THE WAY IT LINKS REMNANTS OF THE ORIGINAL BUSH ON THE FARM

Professor Graeme Martin
graeme.martin@uwa.edu.au

John Dillon Fellow Dr Leylani Juliano from the Philippines visited Australia in March.

The John Dillon Memorial Fellowship is a capacity building program supported by the Australian Centre for International Agricultural Research (ACIAR). The fellowship serves the memory of Professor John Dillon, by providing career development opportunities for outstanding young agricultural

scientists of economists from ACIAR partner countries who are involved in ACIAR projects. The fellows develop leadership skills in agricultural research management, policy or extension technologies by providing exposure to Australian agriculture across a range of best-practice organisations for six weeks.

Dr Juliano works in the area of rice security in the Philippines as a researcher and research manager at the Philippine Rice Research Institute (PhilRice) in Central Luzon. She develops technologies that could increase yield, narrow the yield gap and eventually make good profit for rice and rice-based farmers.

Aside from rice, the team integrates farming systems livestock, vegetables, value adding products, and biomass resource recovery. They work with farmers in participatory technology development and help them become resilient to climate change to which we are very vulnerable of.

Dr Juliano was taken to UWA Farm Ridgefield by the leader of the UWA Future Farm 2050 project, Professor Graeme Martin. Graeme explained the holistic, integrated, multi-disciplinary nature of the project that is setting out to transform Ridgefield into a farm of the future, with major activities in livestock and crop management, ecosystem and biodiversity restoration, and rural community health.

“The visit to UWA Farm Ridgefield provided me much information on what we need to do for the future,” Dr Juliano said. “Indeed, conservation should always be a big part in the agriculture systems.”

The WA grainbelt is very different to Philippino rice fields, but both systems have major challenges in conservation and biodiversity.

Dr Juliano’s first visit to UWA was in 2008, when she visited the Australian Herbicide Resistance Initiative (AHRI) to learn hands-on techniques on herbicide resistance research as part of the capacity building for PhilRice which was involved in an ACIAR project looking at herbicide management strategies for Philippines and Australian cropping systems.

Second Elsevier conference on Agriculture and Climate Change

Prof Dave Edwards
dave.edwards@uwa.edu.au

It is common for climate modellers to attend modelling conferences, and agronomists, breeders or genomics researchers to attend conferences relating to their specific areas. The Elsevier Conference on Agriculture and Climate Change brings together these diverse disciplines.

By sharing knowledge and gaining a greater understanding of the impact of climate change and variability on food production, distribution and use, we can work together to mitigate and adapt the impact of climate change on agriculture and secure sustainable food production for future generations.



The 1st Agriculture and Climate Change Conference was held in 2015 in Amsterdam. Following its success, the 2nd Conference was organised for 27-28 March 2017 in Barcelona, Spain. This meeting was larger, with more than 300 delegates from 59 countries presenting 246 posters. UWA was represented by Professors Dave Edwards, Kadambot Siddique and Rajeev Varshney.

Prof Edwards said the level of interest highlights the issues we face providing food security in a changing climate.

“By getting together and learning from each other, we hope to understand

the issues and develop sustainable solutions,” Prof Edwards said.

“There is an urgent need to increase crop yield, quality and stability of production, enhancing the resilience of crops to climate variability, and increasing the productivity of minor crops to diversify food production.”

Several publications on the likely impact of climate change and variability on crop production, and approaches to maintain and increase crop productivity in a changing climate will be published as a result of the conference.

New Appointments

Katarina Streit

katarina.streit@uwa.edu.au



Katarina Streit has been appointed as a Research Associate within the School of Biological Sciences.

After receiving her PhD from the Comenius University in Bratislava, Slovakia in 2011, Katarina worked at the University of Goettingen, Germany on model development and analysis in the area of functional-structural plant modelling.

Katarina will be working with Assoc/Prof Michael Renton on a GRDC project on pathogen management modelling.

Her main focus will be on developing a simulation model of progression of fungal diseases, such as yellow spot in wheat crop canopies.

Brenda Dagnall

Brenda.dagnall@uwa.edu.au



Ms Brenda Dagnall started in March as Personal Assistant to the IOA Director.

Brenda has been at UWA for six years and most recently was Executive Assistant to the Director of the International Centre for Radio Astronomy Research (ICRAR).

Staff Awards and Industry Recognition

AWARDS AND INDUSTRY RECOGNITION

NAME	AWARD
Ms Myrtille Lacoste	Royal Society Commonwealth Science Conference 2017 travel award
Hackett Prof Kadambot Siddique	Award for excellence in international pulse research & development from the Minister for Agriculture Government of India
A/Prof Ross Kingwell	AARES Quality of Research Communication Prize

Visitors to IOA

NAME OF VISITOR	VISITOR'S ORGANISATION AND COUNTRY	HOST DETAILS	DATES OF VISIT
Dr Christine Foyer	Plant Sciences and Research Director of the School of Biology at the University of Leeds, UK.	Dr Michael Considine	4-17 Feb 2017
Dr Michael Udvardi	Director of the Plant Biology Division at the Samuel Roberts Noble Foundation in Ardmore, Oklahoma, USA	Prof Kadambot Siddique	30 Nov-3 Dec 2016
Professor Kazuhito Kawakita (Dean); Professor Mikio Nakazono; Professor Motohiko Kondo; Dr. Naoko Inoue; Assistant Professor Takao Oi; Ms. Junko Hatcho; Ms. Yukie Hirai	Nagoya University, Graduate School of Bioagricultural Sciences, Japan	Prof Tim Colmer	7-9 Dec 2016
Profs Steve Grattan & Patrick Brown	UC Davis	Prof Tim Colmer	12-14 Dec 2016
Mr Oliver Schliebs	University Tübingen, Germany	Prof Dave Edwards	Oct-May 2017
Mr Brent Verpaalen	The HAN University of Applied Sciences, Netherlands	Prof Dave Edwards	Feb-Jun 2017
Mr Aamir Khan	ICRISAT-IN, India	Prof Dave Edwards	4-9 Feb 2017
Prof/ Vice President Jun Luo	Northwest A&F University, China	Prof Kadambot Siddique, Dr Shimin Liu and Dr Yinglong Chen,	15 Feb 2017
Dr Ying Jiang	University of Adelaide	Prof Kadambot Siddique and Dr Yinglong Chen	15 Feb 2017
Dr Xiezhong Yu	Nanjing University, China	Dr Yinglong Chen	Jan-Feb 2017
Dr Yan Gao	Jiangsu Academy of Agricultural Sciences, China	Dr Yinglong Chen	Feb 2017

NEW RESEARCH GRANTS

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Economic analysis of policies affecting pulses in Pakistan	2016	ACIAR	Dr Elizabeth Petersen, Dr David Vanzetti, Dr Muhammad Qasim, Dr Abdul Ghafoor, Dr Khuram Sadozai
Improving yield by optimising energy use efficiency	2016–2018	Australian National University ex International Wheat Yield Partnership	Professor Andrew Millar, Dr Nicolas Taylor
Development of honeybee products from a biodiversity hotspot	2016–2017	Rural Industries Research & Development Corporation	Dr Katherine Hammer, Professor Cornelia Locher, Dr Michael Clarke
Physical Management Options for Herbicide Resistant Weeds - Targeted Tillage	2016–2017	University of Sydney ex GRDC	Dr Andrew Guzzomi, A/Prof Michael Walsh, Dr Michael Widderick, Dr Bhagirath Chauhan
New Approaches to Quantifying the Properties of Gravel Soils and for Sampling Inverted Soils to Improve Crop Management	2016–2018	DAFWA ex Royalties for Regions	W/Prof Mohammed Bennamoun
Targeting metabolic resistance to the new herbicide pyroxasulfone in the global grass weed <i>Lolium rigidum</i>	2016	Bayer Crop Science	Dr Roberto Busi

POSTGRADUATE RESEARCH STUDENTS

STUDENT NAME	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Muhammad Shoaib Khan	UWA School of Agriculture & Environment and IOA	Prof Phil Vercoe, Prof Graeme Martin	UAF-UWA scholarship
Muhammad Azam Khan	UWA School of Agriculture & Environment and IOA	Prof Martin Barbetti Dr Wallace Cowling Dr Mingpei You	UAF-UWA scholarship
Tmsal Murtaza	UWA School of Agriculture & Environment and IOA	Prof Martin Barbetti Dr Mingpei You	UAF-UWA scholarship
Waseem Abbas	School of Biological Sciences and IOA	Assoc/Prof. Theo Evans Prof Philip Withers	UAF-UWA scholarship
Muhammad Rafay Muzamil	UWA School of Agriculture & Environment and IOA	Prof Petra Tschakert Dr Bryan Boruff	UAF-UWA scholarship

IOA 2016 Publication

Not previously reported

Refereed Journals

Borger CPD, Hashem A, Powles SB (2016). Manipulating crop row orientation and crop density to suppress *Lolium rigidum*. *Weed Research* **56**: 22-30

Busi R, Giroto M, Powles SB (2016) Response to low-dose herbicide selection in self-pollinated *Avena fatua*. *Pest Management Science* **72**: 603-608.

Congdon BS, Coutts BA, Renton M, van Leur JAG & Jones, R. A. C. (2016). Seed fractionation as a phytosanitary control measure for Pea seed-borne mosaic virus infection of field pea seed-stocks. *European Journal of Plant Pathology*, 1-5.

Dillon AJ, Kron P, Walsh M, Jugulam M (2016) Transfer of 2,4-D resistance from *Raphanus raphanistrum* into *Brassica napus*: production of F1 hybrids through embryo rescue. *Canadian Journal of Plant Science* **96**: 384-386

Han H, Yu Q, Owen MJ, Cawthray GR, Powles SB (2016) Widespread occurrence of both metabolic and target-site herbicide resistance mechanisms in *Lolium rigidum* populations. *Pest Management Science*, **72**: 255-263.

Jones RAC. (2016). Future scenarios for plant virus pathogens as climate change progresses. *Advances in Virus Research* **95**: 87-147

Kingwell, R. and Xayavong, V (2016). How drought affects the financial characteristics of Australian farm businesses. *Australian Journal of Agricultural and Resource Economics* **60**: 1–23.

Orchard S, Hilton S, Bending GD, Dickie IA, Standish RJ, Gleeson DB, Jeffery RP, Powell JR, Walker C, Bass D, Monk J, Simonin A and Ryan MH (2016) Fine endophytes (*Glomus tenue*) are related to *Mucoromycotina*, not *Glomeromycota*. *New Phytologist*

Pritchard B, Rammohan A and Sekher M (2016). Land ownership, agriculture and household nutrition: a case study of north Indian villages. *Geographical Research*

Book Chapters

Anderson WK, Stephens D and Siddique KHM (2016). Dryland agriculture in Australia. In: M. Farooq and K.H.M. Siddique (eds) 'Innovations in Dryland Agriculture: Experiences and Innovations'. Springer, Dordrecht, the Netherlands. pp 299-319

Farooq M and Siddique KHM (2016). Researchable issues in dryland agriculture. In: M. Farooq and KHM Siddique (eds) 'Innovations in Dryland Agriculture'. Springer, Dordrecht, the Netherlands. pp. 31-46.

Rammohan, A. (2016), 'Food and nutrition security within the household: Gender and access', *Handbook of Food and Nutrition Security*, Routledge, ed. Pritchard, B et al.

IOA 2017 Publications

(January - March)

Refereed Journals

Arshad MS, Farooq M, Asch F, Krishna JSV, Prasad PVV and Siddique KHM (2017). Thermal stress impacts reproductive development and grain yield in rice. *Plant Physiology and Biochemistry* **115**: 57-72

Barua P, You MP, Bayliss K, Lanoiselet V and Barbetti MJ (2017). A rapid miniaturized system using Alamar blue to assess fungal spore viability: implications for biosecurity. *European Journal of Plant Pathology* **148**: 139-150

Bhandari K, Sharma KD, Rao BH, Siddique KHM, Gaur P, Agrawal SK, Nair RM and Nayyar H (2017). Temperature sensitivity of food legumes: a physiological insight. *Acta Physiol Plant* **39**:68

Busi R, Nguyen NK, Chauhan BS, Vidotto F, Tabbacchi M and Powles SB (2017). Can herbicide safeners allow selective control of weedy rice infesting rice crops? *Pest Management Science* **73**: 71-77

Busi R and Powles SB (2017). Inheritance of 2,4-D resistance traits in multiple herbicide-resistant *Raphanus raphanistrum* populations. *Plant Science* **257**: 1-8

Cayuela ML, Aguilera E, Sanz-Cobena A, Adams DC, Abalos D, Barton L, Ryals R, Silver WL, Alfaro MA, Pappa VA, Smith P, Garnier J, Billen G, Bouwman L, Bondeau A and Lassaletta L (2017). Direct nitrous oxide emissions in Mediterranean climate cropping systems: Emission factors based on a meta-analysis of available measurement data. *Agriculture, Ecosystems and Environment* **238**: 25-35

Clarkson JP, Warmington RJ, Walley PG, Denton-Giles M, Barbetti MJ, Brodal G and Nordskog B (2017). Population structure of *Sclerotinia subarctica* and *Sclerotinia sclerotiorum* in England, Scotland and Norway. *Frontiers in Microbiology* **8**: 490

Considine MJ, Diaz-Vivncos P, Kerchev P, Signorelli S, Agudelo-Romero P, Gibbs DJ and Foyer CH (2017). Learning to breathe: developmental phase transitions in oxygen status. *Trends in Plant Science* **22** (2): 140-153

Dalović I, Šeremešić S, Chen Y, Bekavac G, Biberdžić M, Prijčić Z, Jocković D (2017). Nitrogen, phosphorus and potassium status in maize in temperate semiarid conditions as affected by genotype and fertilization. *Genetika* **49**(2).

Fang X, Snell P, Barbetti MJ and Lanoiselet V (2017). Rice varieties with resistance to multiple races of Magnaporthe oryzae offer opportunities to manage rice blast in Australia. *Annals of Applied Biology* **170**: 160-169

Farooq M, Hussain M, Nawaz A, Lee D-J, Alghamdi SS and Siddique KHM (2017). Seed priming improves chilling tolerance in chickpea by modulating germination metabolism, trehalose accumulation and carbon assimilation. *Plant Physiology and Biochemistry* **111**: 274-283

Frick KM, Kamphuis LG, Siddique KHM, Singh KB and Foley RC (2017). Quinolizidine alkaloid biosynthesis in lupins and prospects for grain quality improvement. *Frontiers in Plant Science* **8** (87)

Gibbs AJ, Ohshima K, Yasaka R, Mohammadi M, Gibbs MJ and Jones RAC (2017). The phylogenetics of the global population of potato virus Y and its necrogenic recombinants. *Virus Evolution* **3**(1): vex002

Guerret MGL, Nyalugwe EP, Maina S, Barbetti MJ, van Leur JAG and Jones RAC (2017). Biological and molecular properties of a Turnip mosaic virus (TuMV) strain that breaks TuMV resistances in *Brassica napus*. *Plant Disease*. <http://dx.doi.org/10.1094/PDIS-08-16-1129-RE>

Gunasinghe N, You MP, Clode P, Cawthray GR and Barbetti MJ (2017). Unique infection structures produced by *Pseudocercospora capsellae* on oilseed crops *Brassica carinata*, *B. juncea* and *B. napus* in Western Australia. *Plant Pathology* **66**: 304-315

Gunasinghe N, You MP, Banga SS, Banga SK and Barbetti MJ (2017). Outstanding host resistance will resolve the threat from white leaf spot disease (*Pseudocercospora capsellae*) to oilseed and vegetable *Brassica* spp.crops. *Australasian Plant Pathology* **46**: 137-146

Guo Y, Si P, Wang N, Wen J, Yi B, Ma C, Tu J, Zou J, Fu T and Shen J (2017). Genetic effects and genotype × environment interactions govern seed oil content in *Brassica napus* L. *BMC Genetics* **18**:1

He J, Du YL, Wang T, Turner NC, Yang RP, Jin Y, Xi Y, Zhang C, Cui T, Fang XW, Li FM (2017). Conserved water use improves the yield performance of soybean (*Glycine max* (L.) Merr.) under drought. *Agricultural Water Management* **179**: 236-245

Hussain M, Farooq M, Nawaz A, Al-Sadi AM, Solaiman ZM, Alghamdi SS, Ammara U, Ok YS and Siddique KHM (2017). Biochar for crop production: potential benefits and risks. *J Soil Sediments* **17**: 685-716

Jalaludin A, Yu Q, Zoellner P, Beffa R and Powles SB (2017). Characterisation of glufosinate resistance mechanisms in *Eleusine indica*. *Pest Management Sci* DOI 10.1002/ps.4528

Konnerup D, Malik IAI, Islam AKMR and Colmer TD (2017). Evaluation of root porosity and radial oxygen loss of disomic addition lines of *Hordeum marinum* in wheat. *Functional Plant Biology* **44**(4): 400-409

Lie W, Li R, Ayalew H, Xia Y, Bai G, Yan G, Siddique KHM and Guo P (2017). Development of a simple and effective silver staining protocol for detection of DNA fragments. *Electrophoresis*

Maina S, Coutts BA, Edwards OR, de Almeida L, Ximenes A, Jones RAC (2017). Papaya ringspot virus populations from East Timorese and northern Australian cucurbit crops: biological and molecular properties, and absence of genetic connectivity. *Plant Disease* (in press).

Maina S, Edwards OR, de Almeida L, Ximenes A and Jones RAC (2017). Metagenomic analysis of cucumber RNA from East Timor reveals an Aphid lethal paralysis virus genome. *Genome Announcements* **5**(2): e01445-16

Nelson MN, Książkiewicz M, Rychel S, Besharat N, Taylor CM, Wyrwa K, Jost R, Erskine W, Cowling WA, Berger JD, Batley J, Weller JL, Naganowska B and B Wolko (2017). The loss of vernalization requirement in narrow-leafed lupin is associated with a deletion in the promoter and de-repressed expression of a Flowering Locus T (FT) homologue. *New Phytologist* **213**: 220-232

Onyemaobi I, Liu H, Siddique KHM and Yan G (2017). Both male and female malfunction contributes to yield reduction under water stress during meiosis in bread wheat. *Frontiers in Plant Science* **7**:

Pak D, You MP, Lanoiselet V and Barbetti MJ (2017). Reservoir of cultivated rice pathogens in wild rice in Australia. *European Journal of Plant Pathology* **147**: 295-311

Pour-Aboughadareh A, Ahmadi J, Mehrabi AA, Erminan A, Moghaddam M and Siddique KHM (2017). Physiological response to drought stress in wild relatives of wheat: implications for wheat improvement. *Acta Physiol Plant* **39**: 106

Qin X, Li Y, Wang L, Siddique KHM and Liao Y (2017). Cereal and soya bean production and food security in China: Challenges and opportunities. *World Agriculture* **1619**

Renton M, Chauhan BS (2017). Modelling crop-weed competition: Why, what, how and what lies ahead? *Crop Protection* **95**: 101-108.

Saradadevi R, Bramley H, Palta JA and Siddique KHM (2017). Stomatal behaviour under terminal drought affects post-anthesis water use in wheat. *Functional Plant Biology* **44**: 279-289

Somerville GJ, Powles SB, Walsh MJ and Renton M (2017). Why was resistance to shorter-acting pre-emergence herbicides slower to evolve? *Pest Manag Sci* DOI 10.1002/ps.4509

Thamo T, Addai D, Pannell DJ, Robertson MJ (2017). Climate change impacts and farm-level adaptation: Economic analysis of a mixed cropping-livestock system. *Agricultural Systems*

Tran HS, You MP, Khan TN and Barbetti MJ (2017). Infection process of *Phoma koolunga* on stem and leaf tissue of resistant and susceptible field pea (*Pisum sativum*). *Plant Pathology* **66**: 212-222

Turner N (2017). Turgor maintenance by osmotic adjustment, an adaptive mechanism for coping with plant water deficits. *Plant, Cell and Environment* **40**: 1-3

Wang JY, Turner NC, Liu YX, Siddique KHM and Xiong YC (2017). Effects of drought stress on morphological, physiological and biochemical characteristics of wheat species differing in ploidy level. *Functional Plant Biology* **44**: 219-234

Wang T, Du YL, He J, Turner NC, Wang BR, Zhang C, Cui T and Li FM (2017). Recently-released genotypes of naked oat (*Avena nuda* L.) out-yield early releases under water-limited conditions by greater reproductive allocation and desiccation tolerance. *Field Crops Research* **204**: 169-179

Wang Y, Liu W, Xu L, Wang Y, Chen Y, Luo X, Tang M, Liu L (2017). Development of SNP markers based on transcriptome sequences and their application in germplasm identification in radish (*Raphanus sativus* L.). *Molecular Breeding* **37**: 26.

Xie X, Qin G, Si P, Luo Z, Gao J, Zhang J, Li Z, Xia Q, Lin F and Yang J

(2017). Analysis of *Nicotiana tabacum* PIN genes identifies NtPIN4 as a key regulator of axillary bud growth. *Physiologia Plantarum*

Zhu Y, Lv GC, Chen YL, Gong XF, Peng YN, Wang ZY, Ren ZT, Xiong YC (2017). Inoculation of arbuscular mycorrhizal fungi with plastic mulching in rainfed wheat: A promising farming strategy. *Field Crops Research* **204**: 229-241

UPCOMING EVENTS

HECTOR AND ANDREW STEWART MEMORIAL LECTURE

3 April 2017
Bayliss Lecture Theatre, UWA

AG INSTITUTE AUSTRALIA CAREERS NIGHT

5 April 2017
Royal Agricultural Society Showgrounds, Perth

POSTGRADUATE SHOWCASE

7 June 2017
Bayliss Lecture Theatre, UWA

INDUSTRY FORUM

18 July 2017
University Club of WA

IOA MISSION

To provide research-based solutions to food and nutritional security, environmental sustainability and agribusiness.

HELP US REDUCE WASTE



To receive this newsletter in electronic format only, please send an email to ioa@uwa.edu.au

Editor: Diana Boykett
ioa@uwa.edu.au
The UWA Institute of Agriculture
+61 8 6488 4717 | ioa.uwa.edu.au
The University of Western Australia
M082, Perth WA 6009 Australia