17th International Plant Nutrition Colloquium 2013 in Istanbul, Turkey, Stephanie Watts-Williams

16 July 2014

Plant Nutrition Trust Travel Scholarship

Stephanie Watts-Williams – 17th International Plant Nutrition Colloquium 2013 in Istanbul, Turkey

I was fortunate enough to be granted a Plant Nutrition Trust award, in order to attend the International Plant Nutrition Colloquium 2013 in Istanbul, Turkey, in August. After a long journey from Melbourne, I arrived into the amazing city that I had heard so much about.

On the first day, we were welcomed to Istanbul and the IPNC by the colloquium's chairman, and esteemed plant nutritionist, Prof. Ismail Cakmak, before settling down to hear the plenary presentation by Prof. Walter J Horst. Throughout the day, we heard talks from some of the world's brightest and best young plant scientists in the Marschner session, dedicated to early career researchers, as well as some wonderful keynote presentations from researchers around the world.

Early on the second day of the colloquium, I was given the opportunity to present a talk in one of the parallel sessions under the topic of 'rhizosphere process, root biology and nutrient acquisition'. I presented my PhD work to date, which involved a number of glasshouse experiments investigating the role of arbuscular mycorrhizas on plant zinc and phosphorus nutrition, and preliminary data from a meta-analysis. I was glad to find that other delegates approached me with questions, both in the designated discussion time, and also in break times during the rest of the colloquium. I thought it was wonderful of the colloquium's committee to have offered oral presentations to so many PhD students, as it gave us the opportunity to expose our research to an audience who may not have encountered it otherwise.

Later that day, I heard some motivating talks in the keynote presentation that centered on the theme of biofortification – a topic that interests me greatly. Speakers included the director of Harvest Plus, Dr. Howarth Bouis, and Prof. Philip White, from the James Hutton Institute. Of particular interest were the new breeds of staple crops that have been genetically engineered to be biofortified with one of iron, vitamin A or zinc, and were in different stages of implementation into agricultural practices in various countries. The three most common micronutrient deficiencies worldwide are represented here, and are thus the focus of Harvest Plus' research. The next challenge for these researchers is to investigate the biofortification of multiple essential micronutrients into one crop. I left this session feeling particularly inspired to take part in research of this nature in the future.

The rest of the week was spent attending various sessions, viewing posters, and networking with other delegates. In particular, there were many talks discussing or utilising imaging techniques that allowed for the visual localisation of nutrients within plant tissues, which many delegates would find useful in

their own research. I left the colloquium contemplating how I could improve the design of my future experiments, based on the techniques I had seen presented over the last four days.

Lastly, Prof Jan Schjoerring presented us with information on the next IPNC, to be held in Copenhagen in 2017. I was leaving for Copenhagen the next day, to embark on a research visit with an esteemed researcher in the study of mycorrhizas, and so left the colloquium feeling even more inspired.

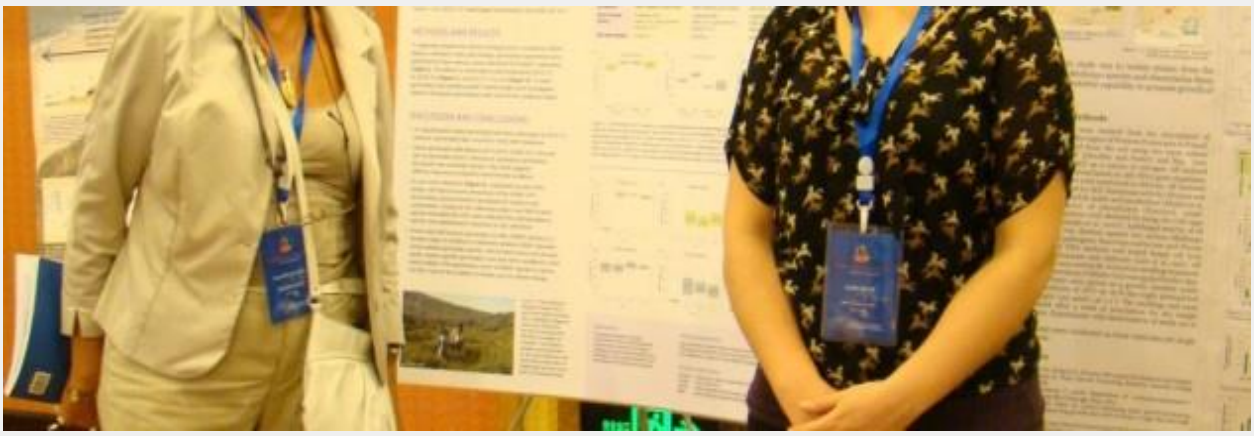
I would like to sincerely thank the Plant Nutrition Trust for this award, which gave me the opportunity to attend my first international conference. While listening to talks gave me an insight into recent advances in plant nutrition, the colloquium also allowed me to meet an interesting and diverse range of researchers in my field.

Stephanie Watts-Williams Monash University

Seed Ecology IV, Shenyang, Liaoning Province, China, by Lydia Guja

16 July 2014

Plant Nutrition Trust Travel Scholarship



Lydia Guja — Seed Ecology IV, Shenyang, Liaoning Province, China

In June 2013, with financial support from the Plant Nutrition Trust, I travelled to Shenyang, Liaoning Province, China to attend the Seed Ecology IV conference. The theme of the conference was 'Seeds and the Future' and the program addressed evolutionary seed ecology, seed dispersal, soil seed banks, seed germination and dormancy, seed longevity and storage, and biodiversity conservation and restoration. The conference program was intense, with 60 oral presentations over 3 days and no parallel sessions. A diverse range of engaging and current seed research was presented.

I gave an oral presentation about my PhD research entitled '*Full spectrum X-ray mapping reveals differential localisation of salt in germinating seeds of differing salt tolerance*'. This research brought together seed scientists and materials scientists from across Australia (with assistance from the R. N Robertson Travelling Fellowship) and investigated how germinating seeds either avoid or tolerate stress from mineral salts in saline environments. This research represents the first investigation of ionic uptake and salt movement in plant seeds using a multi-detector X-ray mapping SEM developed by my collaborators. We demonstrated that damaging ions were compartmentalised in the endosperm of salt-tolerant seeds, but absorbed by the embryo of salt-sensitive seeds. The manuscript describing this research will shortly be available in the Botanical Journal of the Linnean Society. I enjoyed being able to present this research to the Seed Ecology audience and it was well received and generated some engaging discussion and future opportunities for collaboration.

I also presented a poster '*Ecological drivers of seed germination in endangered alpine bog and fen communities in Australia*.' This new research is being undertaken in my role as the Seed Conservation Biologist at the Australian National Botanic Gardens (ANBG) and the Centre for Australian National Biodiversity Research (CANBR). This research focuses on conservation and seed ecology of species that define a nationally listed endangered ecological community, 'Alpine *Sphagnum* bogs and associated fens,' recognised under the Environment Protection and Biodiversity Act 1999. In particular, I am interested in seed germination thresholds in acidic, waterlogged, and cool conditions and how this drives recruitment patterns in such a fragile environment. By presenting the poster I was fortunate to discuss preliminary results and future directions with other researchers working internationally in alpine environments.

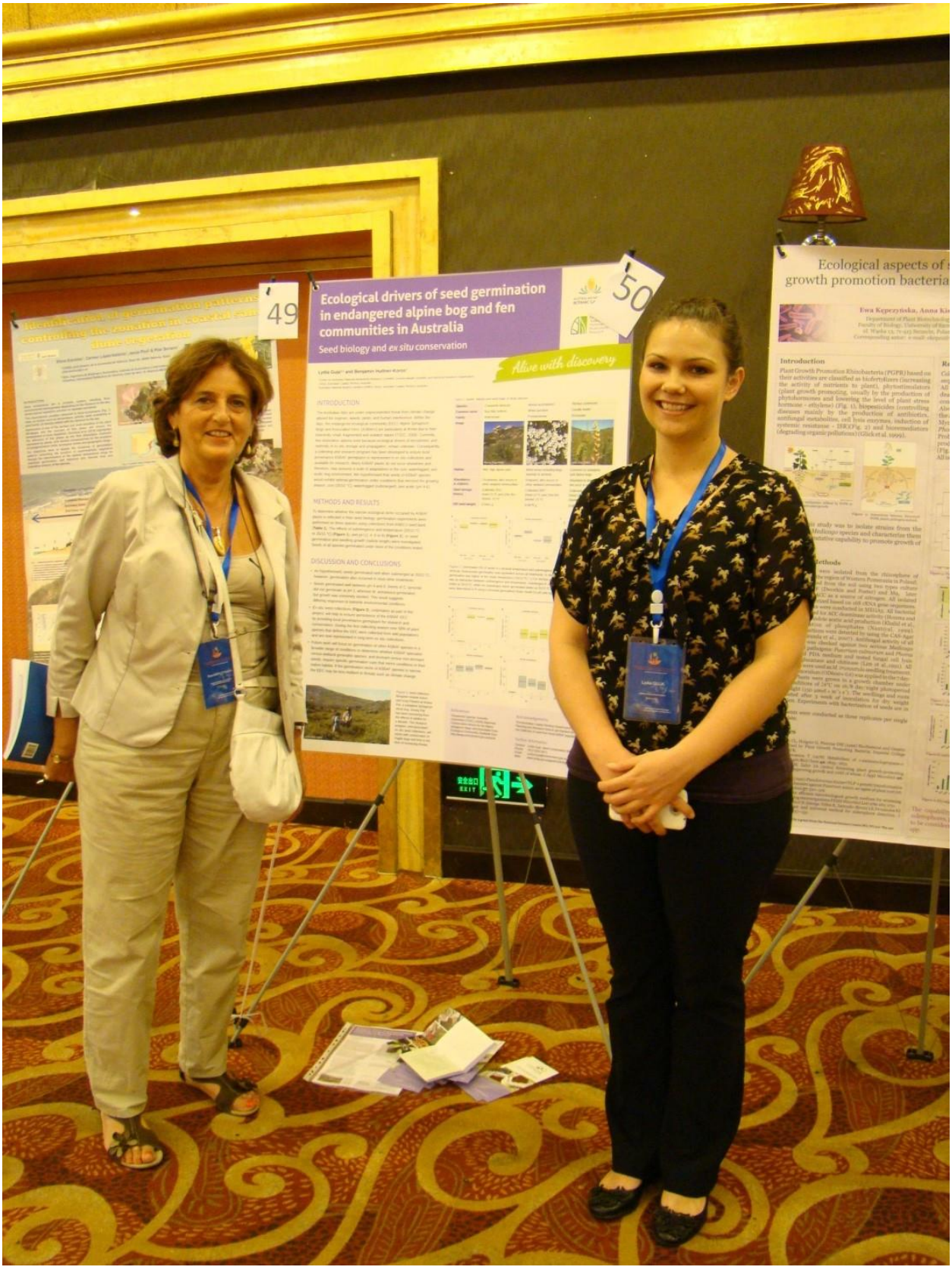
This was my first time travelling to China and I was also fortunate to join the post conference field trip to Inner Mongolia to explore the natural beauty and history of this region. Without the assistance of the Plant Nutrition Trust I would not have been able to attend this conference. I'm very thankful for the opportunity to present my work and keep up to date with the latest seed research, professional subject matter, and communicate with leading seed researchers. The knowledge and networks gained are beneficial both for the completion of my thesis and in my new position as Seed Conservation Biologist at ANBG and CANBR.

Seed Ecology IV Conference in China, June 2013.



Top left: Lydia Guja presenting her X-ray mapping paper.

Below: presenting at the poster session.



Spectacular scenery seen during the post conference field trip to Inner Mongolia, China.

Below: An ovoo serves as both a religious site and landmark in the flat open grasslands.



Bottom : Mongolian gers are still used in the grasslands and are scattered between the large modern Chinese cities.



17th International Plant Colloquium (IPNC) in Istanbul, Turkey by Lachan Palmer

16 July 2014

Plant Nutrition Trust Travel Scholarship

Lachlan Palmer — 17th International Plant Colloquium (IPNC) in Istanbul, Turkey

The Plant Nutrition Trust travel award gave me the opportunity to attend the 17th International Plant Colloquium (IPNC) in Istanbul, Turkey from 19th to 22nd of August. The main theme for this colloquium was “Plant nutrition for nutrient and food security”. There were many excellent talks and informative posters that covered a broad spectrum of plant science and in particular, plant nutrition.

The keynote presentations were varied and full of amazing results. I particularly enjoyed the talk by Howarth Bouis, “Biofortification: A new tool to reduce micronutrient malnutrition” detailing the successes of the Harvest Plus breeding programs to improve the Zn, Fe or pro-Vitamin A status of staple

food crops, and their plans for release into the developing world over the next few years. Results of feed trials using some of these varieties were also presented along with the adoption of these crops within target communities. This talk demonstrated that the increase of nutrients in the grain really can help communities at risk of nutrient deficiency and so improve health and quality of life.

The talk by Prof Jan Schjoerring titled, "Molecular speciation of micronutrients in plants: consequences for transport and storage" demonstrated some of the methods at the cutting edge for identifying and examining nutrient storage compounds by using an array of interconnected, separation and detection systems. The talk detailed work being done on isolating and identifying the compounds involved in binding and storing Zn in the endosperm of rice. This talk gave a fascinating insight into the type of work that can be done when making full use of analytical tools.

The closing plenary presentation by Jian-Feng Ma titled, "Mineral transport from soil to seed" was of great interest as my PhD research is in this area. The work his group is doing on the nodal interface was extremely interesting. The role of this area of research in improving knowledge surrounding the flow of minerals through the plant transport stream cannot be underestimated. I believe that the information presented in this talk and the further reading I have done since will have a great impact on the writing of my thesis and the deciphering of the data I have collected.

Apart from the plenary and key-note presentations there was a great variety of short talks with some very interesting work being presented that is outside of my area of interest, but indeed, still stimulating. In particular, I was fascinated by the work being done in Japan using radioactive isotopes to image plant wide uptake (Tomoko M. Nakanishi "Development of real-time radioisotope imaging system to study plant nutrition") with some amazing real time videos of the uptake and distribution of several elements being presented. I also found the work being done in the far north of the UK, examining the role of root phytases in managing manganese deficiency on calcareous soils of interest (Timothy S. George "Genotypic variation in the ability of plants to tolerate manganese deficiency in cereals grown in calcareous systems: the role of root phytases"). Phytate is normally considered an anti-nutrient but in this instance it may play a role in ameliorating manganese deficiency in some cases.

I was also given the opportunity to present work from my PhD research as a short talk "Micronutrient variability in phloem: changes in zinc concentration during grain loading". This talk demonstrated our success at developing a method for measuring K, Mg, Zn and Fe in nano-litre phloem volumes and maturity related differences in elemental phloem concentration over the course of grain loading. I also presented tissue analysis from plants harvested immediately after phloem collection showing interesting relationships between grain and phloem elemental content. This talk was well received and I had some excellent discussions with academics that will help me in further refining the work for my thesis. We have also had enquiries into possible collaboration to make use of the techniques we have developed from my PhD.

I am truly honoured for the opportunity provided to me by the Plant Nutrition Trust. To have the chance to travel to a major international conference and present my work was a wonderful opportunity for me; one which has expanded and added to my experience as a PhD student and increased my knowledge and understanding in the area of plant nutrition. I look forward to making use of this knowledge in future research opportunities.

17th International Plant Nutrition Colloquium (IPNC) and Boron Meeting 2013, report by Julie Hayes

16 July 2014

Plant Nutrition Trust Travel Scholarship

Report from Recipients of 2013 Plant Nutrition Trust Travel Scholarship Award

Julie Hayes — 17th International Plant Nutrition Colloquium (IPNC) and Boron Meeting 2013

The 17th International Plant Nutrition Colloquium (IPNC'13) was held in August of this year in Istanbul, Turkey. With support from the Plant Nutrition Trust, I was able to attend this meeting, as well as a small satellite meeting on boron held immediately prior to IPNC'13.

I work at the Australian Centre for Plant Functional Genomics, and study aspects of plant nutrition and nutritional stresses. For the last twelve years, I have focussed my research efforts on tolerance to high soil boron in wheat and barley. Thus, I relished the opportunity to participate in a small, specialist meeting discussing boron toxicity and deficiency in agriculture internationally. In attendance were around 80 delegates from across the world, including countries that encounter problems associated with soil boron deficiency (China, India, Bangladesh, Pakistan) and boron toxicity (Turkey, USA). Australia was also well represented, with researchers from both the University of Adelaide and the University of Western Australia – large areas across the southern cereal growing regions of our country have toxic levels of boron in the subsoil. In addition to presenting my own research, I heard talks on a wide variety of research topics, from soil science to molecular studies of boron transport in Arabidopsis. Highlights included a report of a new, slow-release boron fertiliser that should reduce the risk of boron

toxicity arising as a consequence of fertiliser application. A number of papers were also presented from research groups in Japan, who were the first to identify and describe boron transporters in plants.

The theme for IPNC'13 was nutrient and food security, and a number of excellent talks were given around nutritional aspects of food security. Walter Horst (Germany) identified critical gaps in our knowledge of plant nutrition, including the physiology behind nitrogen use efficiency and the role of plant growth promoting microorganisms. Phillip White (United Kingdom) and Michael Grusack (USA) outlined the challenges of manipulating whole-plant nutrient transport to increase the accumulation of mineral elements in edible plant parts. An economist with HarvestPlus, Howarth Bouis (USA), discussed the ever-increasing severity of micronutrient malnutrition ("hidden hunger") for humans in the developing world, and demonstrated the potential for biofortification to have a positive impact. After listening to and viewing the many other oral presentations and posters on topics relating to plant nutrition, I realised the importance of a united effort to identify critical areas of plant nutrition research and to make real progress towards meeting quantity and quality targets for world food production into the future.

Julie Hayes (ACPFG, Adelaide)

The Global Plant Council – An International Voice for Plant Science

16 July 2014

Global Plant Council

The Global Plant Council – An International Voice for Plant Science

2013 Report by Barry Podgson

The world is facing a number of major challenges including feeding a growing population, mitigating the effects of climate change, identifying alternative energy sources and minimising biodiversity and habitat loss. To effectively solve or mitigate these current global problems will require plant science. However to effectively achieve these solutions will require an increase in the understanding of how plant research can contribute to global issues, such as food security, amongst our policy makers and funders.

In 2009 several national plant and crop science organizations around the world met for the first time to discuss world problems and how their scientists and organizations could help by increasing the impact of plant research and raising awareness about opportunities for crop improvement and sustainable agriculture. This was the birth of the Global Plant Council (GPC), which is now a coalition of over 20 plant and crop science societies from across the globe. The central focus of the GPC is to define and engage in coordinated strategies that impact the most critical global issues; world hunger, energy, climate change, health and well-being, sustainability and environmental protection. By working together to formulate a shared vision and allowing distribution of effort the GPC aims to:-

- Increase awareness of the central importance of plant science
- Accelerate progress in solving pressing global problems via plant science based approaches
- Facilitate new research programs to address global challenges
- Enable more effective use of knowledge and resources
- Provide a focus and contact point for plant science across the globe

Since 2009 the GPC has established itself as a non-profit organization and held annual meetings in Montréal Canada (2010), Qingdao China (2011), Jeju S. Korea (2012). These annual meetings have allowed the council to identify a number of strategic initiatives that will help provide plant based solutions to the global challenges we currently face including

- Biofortification of Crops – Improving the nutritional quality of current and new crops
- Digital Seed Bank – Maintaining, understanding and preserving the wealth of crop diversity for future generations
- Diversity and Yield Stability – Identifying strategies for sustainable agriculture such as perennial crops
- Sustainable adaptation to changing environments – Identifying strategies for crop improvement to deal with a changing climate

The GPC has also been working hard to establish a formal organisational structure within council. In May 2013 Dr Ruth Bastow was appointed as the new Executive Director of the GPC and she joins a recently elected executive board consisting of; Prof. Wilhelm Gruissem (European Plant Science Organisation) – Acting President, Prof. Henry Nguyen (American Society of Agronomy and Crop Science Society of America) – Vice President, Prof. Gustavo Habermann (Brazilian Society of Plant Physiology) – Treasurer, Prof. Kasem Ahmed (African Crop Science Society) and Prof. Zhihong Xu (Chinese Society of Plant Biologists).

By exploiting the expertise of this new management structure and working together with other key organisations in this global arena, the GPC is looking forward to fulfilling its role as a strong advocate of plant science at the international level.

For further information on GPC please contact Ruth Bastow, ruth@globalplantcouncil.org

Water Pools in Grape Berries

08 July 2014

RN Robertson Travelling Fellowship



Water Pools in Grape Berries RN Robertson Travelling Fellowship 2013 report

by Johannes Scharwies PhD Candidate

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A joint project between:

University of Adelaide, Waite Research Institute (Johannes Scharwies, Prof. Steve Tyerman)

University of Sydney, Centre for Carbon Water and Food (Dr. Kevin Simonin, Dr. Xin Song, A/Prof. Margaret Barbour)

Funding through the RN Robertson Travelling Fellowship by the Australian Society of Plant Scientists allowed me to visit the laboratory of Assoc. Prof Margaret Barbour at The University of Sydney's

Camden Campus and work with Dr. Kevin Simonin and Dr. Xin Song to investigate water pools in grape berries using novel stable isotope techniques.

As part of my previous Masters by Research and my current PhD at The University of Adelaide some of my research focuses on how different water pools in plants are integrated in the transpiration stream. During my Masters by Research, I investigated pre-harvest berry dehydration in Australia's most popular red grape variety Shiraz, which can lead to significant yield losses. Berries that are affected show an imbalance between water uptake and water loss at the end of ripening causing shrivelling of the berries and concentration of sugars. This may make these berries less suitable for wine production.

When I presented my research at COMBIO 2012 in Adelaide, I was introduced to Assoc. Prof. Margaret Barbour and Dr. Kevin Simonin form The University of Sydney, who presented a poster on a novel stable isotope technique that they used to investigate changes in stable isotope composition of water in the leaf during transpiration. We discussed that this technique could also be used to investigate the contribution of different water pools to the transpiration stream in grape berries. This could reveal the sources of water which are lost during pre-harvest berry dehydration.

At the beginning of 2013, I was fortunate to win a scholarship to visit the workshop "Stable Isotopes in Biosphere Systems" at The University of Sydney's Camden Campus. This workshop gave me a great overview about this topic that was completely novel to me and experiments that were part of the workshop demonstrated many different techniques that can be used to investigate the environment and plants using stable isotope techniques.

Encouraged by this workshop, I applied for the RN Robertson Travelling Fellowship to return to The University of Sydney and work on a project with the aim to use stable isotopes of water to trace water movement through developing grape berries. My successful application for this fellowship gave me the opportunity to return to Sydney at the beginning of this year.

For our experiments we used source water slightly enriched in $H_2{}^{18}O$ to allow calculations of berry water turnover time. Up to 20 individual berries attached to tubing for source water uptake were enclosed in a gas exchange cuvette, which proved to be better than using intact grape clusters (Fig. 1). Source water uptake was measured gravimetrically, and air leaving the cuvette was analysed by an infra-red gas analyser and an isotopic water vapour analyser. Our experiments showed that pre-veraison berries had a turnover time for water of 2.5 days, and that 60% of the water within the berry was involved in the evaporative flux. The remaining 40% of the berry water appears to be hydraulically disconnected from the flow of water.

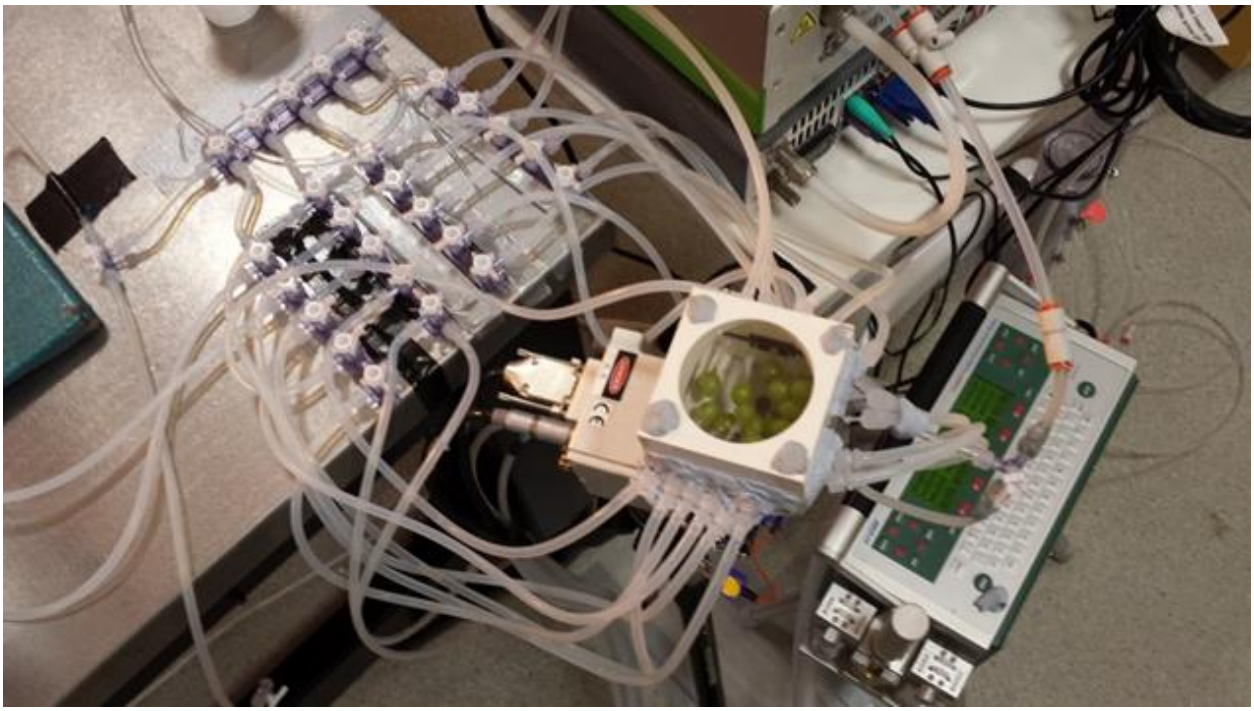


Figure 1. Sixteen berries, each connected to the source water by tubing, are enclosed within a gas exchange cuvette. Air leaving the cuvette, is sampled by an infra-red gas analyser and an isotopic water vapour analyser.

At the end of this year, I'm planning to return to Sydney to quantify the turnover time and degree of hydraulic connection for berries of different varieties, and at different stages of development. We will also experimentally modify water exchange between symplastic and apoplastic water pools by using chemical blocker substances that are known to change water permeability of aquaporins, which are molecular water channels in cell membranes. By directly extracting symplastic and apoplastic fluids from berries at different times of the experiment, we also hope to gain direct evidence for different rates of water enrichment for these two pools.

I'm very grateful to the Australian Society of Plant Scientists for funding my project, which gave me the opportunity to learn this new exciting technique and apply it to my research on grape berry water relations. I would also like to thank Assoc. Prof Margaret Barbour, Dr. Kevin Simonin, and Dr. Xin Song from The University of Sydney for inviting me to their laboratory and their help with the experiments, and my supervisor Prof. Steve Tyerman from The University of Adelaide for his support. Thanks also to Ms Wendy Sullivan, who took care of the grapevines, at The University of Adelaide.