School of Agriculture, Food & Wine

Summer Scholarship Projects 2020/2021

Biometry Hub

Food & Nutrition Science

Plant Protection

Plant Genetics, Genomics & Breeding

Plant Physiology Viticulture & Horticulture

SARDI Entomology

Biometry Hub

Project Title: ***Developing web applications for data pipeline in agronomy experiments***

Supervisor: Olena Kravchuk and Sam Rogers
E-mail: **olena.kravchuk@adelaide.edu.au**

Brief Project Outline:
Field observations are collected nowadays in automatic or semi-automatic way, when human observations, image, spectral and other type of data are combined together to describe objects in experiments or field surveys. The data collection process is prone to human error and may cause inefficiency in projects or bias in data analyses and interpretations. This project uses the Shiny R software package to develop several data pipelines for typical projects for on-farm trials for grains and meat and livestock experimentation in the Southern region.

Techniques/Skills Learnt:

- Fundamentals of statistical principles for design and analysis of single-site
- Basic use of R for data management, tabulation, presentation and checking for data quality
- Basic use of Shiny for designing efficient single-machine apps for data pipelines

Project Title: ***On incorporating spatially balanced sampling design for the quality control of field maps***

Supervisor: Olena Kravchuk and Peter Kasprzak (Blair Robertson, University of Canterbury, NZ, external supervisor)
E-mail: **olena.kravchuk@adelaide.edu.au**

Brief Project Outline:

Yield and soil maps are commonly available nowadays for general field operations as well as research purposes in agronomic inquiries. Anecdotally, there has been raised an issue with the lack of reliability of the quality of such maps in the agronomy studies in Australia and worldwide. Cammarano et al. (2020) proposed a simulation model to study temporal and spatial yield variations. This project applies similar principles to build simulations of crop variability for yield maps available for the Southern region in Australia for various crops. We are interested in investigating strategies for spatial sampling competing with the standard geo-statistics grid sampling for checking the quality of the maps.

Cammarano, Davide, Jonathan Holland, and Domenico Ronga. "Spatial and temporal variability of spring barley yield and quality quantified by crop simulation model." *Agronomy* 10.3 (2020): 393.

Techniques/Skills Learnt:

- Fundamentals of precision agriculture, yield and soil maps
- Fundamentals of geo-statistics and spatial sampling
- Basic use of R and specialised packages for simulation studies of crop maps

Food & Nutrition Science

Project Title: ***Food Retail Industry Compliance with Labelling and Information Requirements***

Supervisor: Helen Morris
E-mail: helen.morris@adelaide.edu.au
Location: Charles Hawker Building, Waite Campus
This project is open to 1 – 2 students

Brief Project Outline:
The Australia New Zealand Food Standards Code sets out the labelling and information requirements for food that is for retail sale. It is the responsibility of food businesses to ensure that labelling of their retail products complies with the requirements of the Code.
Food and Nutrition Science students examine food labels during their Nutrition tutorial classes. A small number of the food labels examined in 2019 were found to be not fully compliant with labelling and information requirements.
During the 2019-2020 summer break, Summer Research Scholarship students took 300 photos of current food products for retail sale and then examined the labels of these products for compliance with the requirements set out in the Code.
This project aims to add to and finalise the analysis of these labels.
To find out more about this project please contact Helen by email.

Techniques/Skills Learnt:
- The application of food labelling and information requirements to food that is for retail sale, as set-out in the Australia New Zealand Food Standards Code.
- Reading food labels
- Collection of data and entry into an Excel spreadsheet
- Analysis of data against a set of standards
- Communication of project outcome/s

Plant Protection

Project Title: ***The recovery of pollination services after fire***

Supervisor: Katja Hogendoorn / Remko Leijs
E-mail: katja.hogendoorn@adelaide.edu.au; remko.leijs@adelaide.edu.au

Brief Project Outline:
Pollination is crucial for the production of 85% of our food crop species. It is likely that bushfires greatly impact pollinators and their services, but not much is known about this. Impacts can be both direct, as bees and their nests burn, and indirect as a result of a temporary absence of food in burnt landscapes. Twig and stem nesting bees may suffer more from fires than ground nesting species, and one would expect differences in timing of recovery that are related to nesting strategy, lifecycle and diet specialisation. However, the impact has not been quantified and insights into the recovery of native bees after fire are lacking. To study the effects of fire and the recovery of the bee fauna, we will catch bees using a vehicle net, at locations in the Adelaide hills that differ with respect to fire history. This is a novel sampling method that allows ultra-standardised sampling.
We will catch and pin the bees caught, and compare them to a reference collection to identify them. Where necessary, we will generate a CO1 barcode sequence to identify using a barcode library. This project would suit a student with an interest in ecology and entomology.

Techniques/Skills Learnt:

- Bee collection, labelling, preservation and identification of the major bee groups
- Understanding of native bee biology and ecology
- CO1 sequencing
- Analysis of diversity

Project Title: ***The native bees that pollinate apple: what sustains them in summer?***

Supervisor: Scott Groom / Katja Hogendoorn
E-mail: scott.groom@adelaide.edu.au; katja.hogendoorn@adelaide.edu.au

Brief Project Outline:

Pollination is crucial for the production of 85% of our food crop species. Apple flowers in October and are pollinated by managed and feral honey bees and by 15 species of native bees. Nearly all native bees have a summer generation, during which they rely on other food plants. When we understand the food plants that support these bees in and around the orchard in summer, we can encourage farmers to plant more of these plants and improve diversity and resilience in pollination services.

We will catch, pin these bees and identify native bees in and around apple orchards, as well as the plants they collect nectar and pollen from. We will record the plant species visited, catch and pin the bees caught, and identify them by comparing them to a reference collection. Where necessary, we will generate a CO1 barcode sequence to identify by comparison to a barcode library. This project would suit a student with an interest crop pollination and ecology of native bees.

Techniques/Skills Learnt:

- Bee collection, labelling, preservation and identification of the major bee groups
- Understanding of native bee biology and ecology
- CO1 sequencing
- Analysis of diversity and plant pollinator networks

Plant Genetics, Genomics & Breeding

Project Title: ***Identifying candidate genes involved in Ascochyta blight resistance in Chickpea***

Supervisor: Dr. Yongle (Leo) Li
E-mail: yongle.li@adelaide.edu.au

Brief Project Outline:
Chickpea (*Cicer arietinum* L.) is an important pulse rich in protein and essential micronutrients. Australia is the second-largest chickpea producer in the world and the chickpea production area is projected to increase significantly as the result of strong market demand for plant-based protein. However, Ascochyta blight (AB), caused by the fungus *Ascochyta rabiei*, is a major disease that limits the expansion of chickpea production in Australia. To development durable genetic resistance to AB, we will measure AB resistant level of a large number of exotic chickpea plants in the field and identify candidate genes involved in AB resistance.

The work of the student will be mainly computer-based such as using exiting software to analyse phenotypic data and DNA sequence data.

Supervisor info:
https://researchers.adelaide.edu.au/profile/Yongle.Li

Techniques/Skills Learnt:

- DNA extraction
- Analysis of phenotypic data (disease resistance etc.)
- Analysis of Next-generation sequencing data
- Bioinformatics and biostatistics

Plant Physiology Viticulture & Horticulture

Project Title: ***Germination trials for plasma-treated grains***

Supervisor: Bryan Coad; Melanie Ford
E-mail: bryan.coad@adelaide.edu.au; melanie.ford@adelaide.edu.au

Brief Project Outline:
This project will investigate germinated plant health from seeds that have been subjected to a novel decontamination method. The use of high-energy plasmas provides an alternative to chemical treatments for controlling microbial pathogens and may also improve seed germination. The placement will involve conducting germination experiments in a glasshouse and measuring plant health and morphological traits. Outcomes will contribute to knowledge of the application of plasmas as a novel agricultural technology.

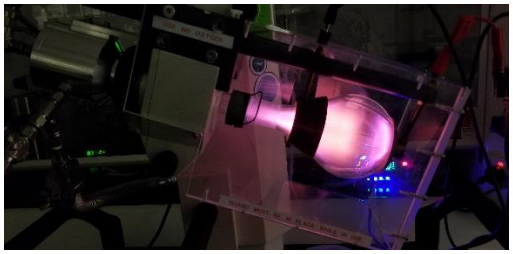

Figure 1 Mad Science - plasma treatment of grains

Techniques/Skills Learnt:

- Porometer and SPAD
- Root morphology and characterisation
- Air plasma generator operation

Project Title: ***Turning agricultural waste into advanced functional materials***

Supervisor: Bryan Coad, Vincent Bulone
E-mail: bryan.coad@adelaide.edu.au

Brief Project Outline:
This project will involve research and development of new materials that have uses in food packaging, structural reinforcements, bioplastics, or functional materials. We are using fruit and vegetable biomass generated as wastes from local growers, and extracting out high-value biomolecules/biopolymers. These are purified and put to new use as novel materials. The project will also involve analytical evaluation of materials using instrumental analysis.

Techniques/Skills Learnt:

- physical/chemical extraction of biomolecules from waste biomass
- purification of biomolecules
- fabrication of materials
- instrumental analysis

SARDI Entomology

Project Title: ***Evaluating Physical and Chemical Barriers to Fruit Fly Emergence from Soil***

Supervisor: Dr Katharina Merkel
E-mail: Katharina.merkel@sa.gov.au

Brief Project Outline:

Fruit Fly are a major economic and lifestyle threat to South Australia. The two major Fruit Flies that are a threat to SA's Horticultural industries are Mediterranean Fruit Fly and Queensland Fruit Fly, both are polyphagous and can damage fruit on over 200 plant species. The adults lay eggs in the fruit and as the larvae develop, spoiling the fruit, on maturing the larvae drop to soil to pupate where they develop into adults and emerge from the soil.

To protect SA's Fruit Fly free status and associated horticultural export advantages Biosecurity SA maintain over 7000 traps across the state and conduct eradication programs if flies are detected. Part of the eradication process involves bait spraying trees to attract and kill adult flies. In general, bait sprays contain feed attractants that lure the flies to feed on them. They also contain an insecticide ingested by the flies. There are a number of commercial products on the market that are already applied in eradication programs, e.g. Naturalure and Anamed. The aim of this project will be to compare the available options under South Australian climatic conditions and to evaluate novel combinations.

The Scholarship Holder will conduct a series of mainly Laboratory based trials at Waite Campus with the SARDI Entomology Program.

Techniques/Skills Learnt:

- Experimental design
- Data collection and analysis
- Report writing

Project Title: ***Evaluating Physical and Chemical Barriers to Fruit Fly Emergence from Soil***

Supervisor: Dr Katharina Merkel

E-mail: Katharina.merkel@sa.gov.au

Brief Project Outline:

Fruit Fly are a major economic and lifestyle threat to South Australia. The two major Fruit Flies that are a threat to SA's Horticultural industries are Mediterranean Fruit Fly and Queensland Fruit Fly, both are polyphagous and can damage fruit on over 200 plant species. The adults lay eggs in the fruit and as the larvae develop, spoiling the fruit, on maturing the larvae drop to soil to pupate where they develop into adults and emerge from the soil.

To protect SA's Fruit Fly free status and associated horticultural export advantages Biosecurity SA maintain over 7000 traps across the state and conduct eradication programs if flies are detected. Part of the eradication process involves treating and covering soil under trees where larvae are detected in fruit to kill adults emerging from pupae in the soil. There are a number of chemical and soil coverings options available the aim of this project will be to evaluate the options to elucidate which is the most effective and suited to both Rural and Urban situations.

The Scholarship Holder will conduct a series of Laboratory based trials at Waite Campus with the SARDI Entomology Program and possibly be involved in one or two field trips to collect soil for the trials.

Techniques/Skills Learnt:

- Experimental design
- Data collection and analysis
- Report writing