NEW PLANT PRODUCTS

RIRDC Completed Projects in 2010 - 2011 and Research in Progress as at June 2011

RIRDC Publication No. 11/148
NEW PLANT PRODUCTS

Completed Projects in 2010-2011
Research in Progress at June 2011

December 2011

RIRDC Publication No 11/148
Foreword

RIRDC produces summaries of completed and continuing projects each financial year. Our intention is to:

- provide stakeholders with early access to the results of ongoing and completed work to inform their decisions, and
- inform researchers of results to shape research directions.

The *New Plant Products, Completed Projects in 2010-2011 and Research in Progress at June 2011* contains short summaries of projects funded by the program. The New Plant Products Program aims to facilitate the development of new and emerging industries based on plant or plant products that have commercial potential for Australia.

The New Plant Products Program is divided into seven categories. These areas are:

1. Native Foods
2. Culinary herbs, spices and beverages
3. Extractive and fibre crops
4. Fruit, vegetables and nuts
5. Grains and pulses
6. Cultural and World Foods
7. Miscellaneous

This report is an addition to RIRDC’s diverse range of over 2000 research publications which are available for viewing, free downloading or purchasing online at [www.rirdc.gov.au](http://www.rirdc.gov.au). Purchases can also be made by phoning 1300 634 313.

_Craig Burns_
Managing Director
Rural Industries Research and Development Corporation
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Completed Projects - Native Foods

PRJ-007188  Initiating the Australian Bush Plum Collection

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Objectives
Initiate the range-wide sample collection for the domestication of Australian Bush Plum (*Terminalia ferdinandiana* Excell.)
Distribute and store samples between project partners: Kimberley TAFE, Charles Darwin University (CDU), CSIRO, Department of Environment and Conservation (DEC) and the University of Western Australia (UWA).

Background
Australian Bush Plum (*Terminalia ferdinandiana*) fruit are currently being harvested from the native population for Aboriginal domestic use, production of food products and as a natural vitamin C source. Whilst the popularity of the fruit for these products is increasing, supply is determined by the limitations of native harvesting.
To meet demand beyond traditional use, the domestication and development of tree enrichment systems is required.

Research
This project coordinated a collection of *T. ferdinandiana* material as a first stage to enable an assessment of site, genetic and fruit quality variability for product optimisation, be the source of plant material for the development of enrichment plantings and used for training the local indigenous communities. 44 single tree samples from both WA and NT were collected and stored for further analysis and use.

Outcomes
This project had the simple outcome of collecting samples from as many *T. ferdinandiana* populations as possible across WA and the NT as was constrained by picking season logistics with the funding made available. The samples were distributed to Kimberley TAFE, CDU, CSIRO, DEC and UWA. The leaf DNA was not successfully extracted due to the phenolics and alternate methods will need to be developed.

Implications
The research and training team are ready to progress with closer interactions with Aboriginal clans that are involved in the Australian Bush Plum fruit-gathering industry and to add-value to this growing industry.
### Completed Projects - Native Foods

**PRJ-004171** Specific physiological activity of Australian native fruits

| Start Date: | 23/09/2008 |
| Finish Date: | 30/05/2011 |
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**Objectives**
To obtain reliable information about the potential health benefits arising from consumption of the leading commercially grown three native Australian herbs (Tasmannia pepper leaf, anise myrtle and lemon myrtle) as identified through a vast range of reagent-based and cell culture based studies.

**Research**
Polyphenolic-rich extracts, representing a mixture of compounds that would be released into food in the process of food preparation, were prepared in a form of a lyophilised, fine powder. Their composition and antioxidant capacities were characterized with a help of a high performance liquid chromatography and reagent-based assays. Subsequently, the extracts were assessed in an array of human/mammalian cell cultures-based and isolated enzyme-based assays, recognised as models for samples’ screening with an objective to identify their potential health properties.

**Outcomes**
Polyphenolic-rich extracts obtained from 3 herbs and 2 fruits carry the characteristics of original crude extract, as described in PRJ-002330. Tasmannia pepper leaf (TPL) extract exhibited superior oxygen radical absorbance capacity weather Davidson’s plum (DP) and lemon myrtle (LM) extracts had the highest total reducing capacity. Phenolic compounds of all extracts are able to enter a life cell and to act as antioxidants within the life cell with TPL, followed by AM, having a superior cellular antioxidant activity. This indicates a protection of cell components (DNA, RNA, lipids, enzymes, etc.) from the damaging action of endogenous free radicals and reduction of oxidative stress. All extract displayed anti-proliferative activity against human cancer cells, without negative effect on normal (non-transformed) cells. Induction of apoptosis, which is the preferred way to remove cancer cells from a human body without inflammation, was identified as the mechanism of anti-proliferative activities against. Anise myrtle (AM) emerges as an important source of bioavailable phytochemicals that most effectively suppresses the proliferation of cancer cells through induction of apoptosis. The presence of ellagitannins, identified at high levels in the extract, might be responsible for the enhanced physiological activities. All extracts effectively inhibited α-glucosidase and pancreatic lipase enzymes, which indicates their potential utilization in the prevention and reduction of metabolic syndrome. AM, LM and DP had a superior α-glucosidase inhibitory activity, followed by TPL, whether quandong (Q) and TPL effectively inhibited pancreatic lipase.

**Implications**
This project for the first time has shown significant potential of selected native Australian fruits and herbs to modulate human health. The information can be utilised in the development of new original Australian health-promoting foods and their popularisation in the country and overseas.
Objectives

- The primary objective for this project was to have an Australian Herb & Spice R&D levy implemented by 1 July 2011.
- The levy was to be administered by RIRDC in support of the objectives of the Research & Development Strategy for the Australian Herb and Spice Industry - 2006-2011.
- Implicit in this R&D Levy project is the need to consolidate industry support for a statutory levy ahead of a proposed ballot on the levy proposition to be scheduled in October 2010.

Background

This project was undertaken because industry currently lacks the quantum or reliability of funding necessary to implement the RIRDC New Plant Products program for the Australian herb & spice industry as described in the Research & Development Strategy for the Australian Herb and Spice Industry: 2006-2011. The major focus of this plan has been to support the science and application process to secure Minor Use Permits as issued by the Australian Pesticides and Veterinary Medicines.

A further objective of this project was to implement a biosecurity levy for the Australian herb and spice industry, to fund industry membership of Plant Health Australia (PHA), and associated industry biosecurity awareness and preparedness activities.

Research

The project describes the following three phases of the research:

- Phase 1 – Project planning and development of the levy proposition in consultation with a project steering committee.
- Phase 2 - Industry consultation on the levy proposition undertaken in accordance with the Australian Government’s Department of Agriculture, Fisheries and Forestry Levy Principles and Guidelines (January 2009), culminating in a ballot by eligible producers on the levy proposal(s), to be independently undertaken by the Australian Electoral Commission.
- Phase 3 – Subject to the levy proposition being supported by industry, preparation of a formal submission to the Federal Minister for Agriculture, Fisheries and Forestry, plus preparation of milestone and final reports as required by RIRDC.
Implications and Outcomes

While the levy was defeated on a “one person, one vote” basis, it is evident that, had the votes been on the basis of production levels, it may have succeeded. For any future levy proposal to succeed, much more work will need to be done by Australian Herb and Spice Industry Industry Association (AHSIA) to build stakeholder confidence in and acceptance of the representative role of AHSIA for the proposed range of herb and spice products. This will require improved communications and a sharper value proposition to build membership levels.
## Completed Projects – Grains and Pulses

**PRJ-002323  Drought Tolerance of novel perennial legumes**

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<tbody>
<tr>
<td><strong>Finish Date</strong></td>
<td>1/7/2010</td>
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<td><strong>Researcher</strong></td>
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</tr>
</tbody>
</table>

### Objectives

The objective of this project is to characterise the degree of drought tolerance and mechanisms conferring drought tolerance in a selection of novel perennial legumes under two circumstances:

- During the establishment phase (glasshouse and first year of field experiments).
- As mature plants (second year of field experiments).

In the glasshouse trial, drought tolerance will be compared between species/accessions by examining:

- the impact on plant shoot and root biomass accumulation of an extended period of non-watering and
- the ability of the plants to accumulate biomass over a period of time after watering is resumed. Drought tolerance in the field will be compared between species/accessions by comparing the percentage of the population surviving after summer each year and the biomass accumulation over summer for two years.

### Background

Perennial pastures provide many benefits both for the environment (reduced groundwater recharge, decreased summer erosion) and for farmers (provision of green feed in the summer/autumn feed-gap). Legumes have the additional benefit of provision of biologically fixed nitrogen. There are few perennial legume pasture cultivars available for the low rainfall areas of the southern wheatbelt: areas that in Western Australia are predicted to experience a drying climate. In response to this need, a range of novel perennial legumes, both native and exotic to Australia, were evaluated for their tolerance to water stress in a glasshouse study and for their survival and productivity at three sites in the low rainfall wheatbelt of Western Australia. Previous studies suggested a focus on the exotic *B. bituminosa var. albomarginata* (albo-tedera) and the native *C. australasicum* was merited.

### Research

This project consisted of two components. The glasshouse experiment examined the response to water stress of *B. bituminosa var. albomarginata* (3 accessions), *C. australasicum* (2 accessions), *C. pallidum* (1 accession), *C. cinereum* (1 accession), *Macroptilium atropurpureum* (1 cultivar), *Kennedia prostrata* (1 accession) and *Medicago sativa* (lucerne, 1 cultivar). Water stress was imposed after 4 months by ceasing to water. A companion *M. sativa* plant in each pot ensured that each species experienced a similar level of water stress, irrespective of leaf area. Plants were harvested when stomatal conductance was reduced to ~10% of well-watered control plants. Measurements were made before the imposition of the water stress, and at the final harvest of water–stressed and well-watered plants, of shoot and root biomass, root distribution down the pot, green leaf area, specific leaf area, leaf senescence, physiological adaptations such as leaf water potential and osmotic adjustment, and the rate of photosynthesis.

Two field experiments were replicated at three locations in the Western Australian wheatbelt: Buntine (a hot, dry site), Merredin (a hot, dry site with poor acidic soils) and Newdegate (coolest site). The experiments ran from June 2008...
to May 2010. In the first experiment, accumulated shoot dry weight production (over one year) and survival (over two years) of two accessions of B. bituminosa var. albomarginata (1-erect and 6-prostrate) and C. australasicum (SA42566 and SA44373) were studied at plant densities of 1, 2, 4, 8 and 16 plants/m² and cutting frequencies of 1, 2, 3 and 4 cuts/year. Plants were established as transplanted seedlings. In the second experiment, seeds were sown and the emergence and survival of C. australasicum (3 accessions), C. cinereum (1 accession) and C. pallidum (1 accession) and *B. bituminosa var. albomarginata* (4 accessions) were studied over two years. *M. sativa* was included as a reference species.

**Implications and Outcomes**

The primary implication of this study is that the exotic perennial legume *B. bituminosa var. albomarginata* (albo-tedera) shows considerable potential for development as a drought-tolerant perennial pasture for the low rainfall Western Australian wheatbelt. It should be further developed with the aim of release of a commercial cultivar in the near future. The main strength of this species is the production of up to 2 t/ha (dry weight) of green leafy shoot material during the summer-autumn feed gap (January-May). Further studies are now required.

The glasshouse experiment identified a large range of responses to water stress including: a reduction in shoot growth rate; leaf curling, wilting and drop; an increase in root:shoot ratio; an increase in the proportion of roots at either depth or the surface; a reduction in specific leaf area; large reductions in leaf water potential; and osmotic adjustment. Responses differed among species and accessions of the same species. The greatest tolerance of water stress was in *B. bituminosa var. albomarginata* accession 22 and *C. australasicum* accession SA44239.

The field trials showed that both *C. australasicum* and *B. bituminosa var. albomarginata* have potential to be developed as perennial pasture legumes for the low rainfall zone of the wheatbelt of Western Australia, with the ability of both species to produce substantial green feed (up to 2 t/ha dry weight) over summer making them an attractive option for farmers. Survival of *C. australasicum* was generally poorer than for *B. bituminosa var. albomarginata* and for both species further work is required to establish protocols for establishment from seed. Plant survival of both species did not vary greatly with cutting frequency or density. First year accumulated shoot dry weight was highest for *B. bituminosa var. albomarginata* accession 1 at Newdegate. Shoot dry weight of *C. australasicum* was similar to *B. bituminosa var. albomarginata* at the less productive sites. *B. bituminosa var. albo-marginata* was generally leafier than *C. australasicum*. As the accessions of these species are unselected germplasm, there is considerable potential to improve performance through trialling of additional accessions or selecting high performing individual plants from within accessions. *C. pallidum* had a similar survival rate to *C. australasicum*, and evaluation of further accessions of *C. pallidum* and *C. cinereum* is warranted.

The glasshouse experiment identified a large range of responses to water stress including: a reduction in shoot growth rate; leaf curling, wilting and drop; an increase in root:shoot ratio; an increase in the proportion of roots at either depth or the surface; a reduction in specific leaf area; large reductions in leaf water potential; and osmotic adjustment. Responses differed among species and accessions of the same species. The greatest tolerance of water stress was in *B. bituminosa var. albomarginata* accession 22 and *C. australasicum* accession SA44239.

**Publications**

Three papers will be submitted to high impact international refereed journals in 2010.

1) The glasshouse study (intended journal *Annals of Botany*)
2) The field study - establishment and survival (*Field Crops Research*)
3) The field study - productivity (*Field Crops Research*)
Completed Projects - Cultural and World Foods

PRJ-002391  Changing decision making by LOTE growers

Start Date: 20/06/2008
Finish Date: 20/06/2011
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Objectives
The aim of the project was to help deliver a sustainable Asian vegetable industry by working with growers of a LOTE (Language Other Than English) background to enable them to produce:

- quality Asian vegetables acceptable to major supermarkets / for export
- safe vegetables free of pests and disease and produced with minimal use of pesticides
- price competitive and profitable Asian vegetables.

Outcomes of the project: improved Asian vegetable production efficiency and increased profitability whilst maintaining an ecologically sustainable industry conducted by quality assured LOTE background growers.

Background
The wholesale value of Asian vegetable industries in Australia has risen from $51 million in 1995 (Lee, 1995) to $204 million in 2007/08 (Lee, 2011). During the same period, the value of Asian vegetable production in Victoria was increased from $4.1 million to $29 million (Lee, 2011). However, if the industry does not meet the consumer demand for quality, safety and hygiene, some of the producers may face a challenge to survive in the industry.

Currently in Victoria, there are about 60 LOTE growers involved in the commercial production of Asian vegetables. The grower group targeted in this study has around 30 farmers of Vietnamese background. New people are continually entering the industry while only few leave. Some growers who have recently entered the industry have very little knowledge of production practices. Existing growers have gradually started to expand their production, farm sizes and use of modern technology in recent years.

Research
This project conducted a range of activities, including training and field demonstrations to assist LOTE grower groups manage chemical residues in their produce, improve quality and hygiene, manage native vegetation to promote integrated pest management and reduce chemical use.

Relevant training sessions were provided with the assistance of translators.

Outcomes
An analysis of chemical residues was carried out to evaluate the success of the project. The analysis showed that, following the introduction of appropriate practices, compliant management had been achieved.

Competent bilingual support, relevant training programs, active ground support and the determination of growers were equally important in this success.

Results indicate that native vegetation can be beneficial for integrated pest management. However, more comprehensive studies are needed to confirm this. There are also indirect benefits such as weed control, aesthetic improvement, increase in ground covers protecting bare soils etc.

Implications
This study demonstrates that, with a methodical approach and moderate resources, significant positive changes to behaviour can be achieved. There was an indication that beneficial insects find refuge in retained native vegetation. However current chemical practices of the growers needs to be altered to accommodate better integrated pest management.
## Completed Projects - Cultural and World Foods

**PRJ-003648  Continuation of the Access to Asian Foods Newsletter**

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<tbody>
<tr>
<td>Finish Date:</td>
<td>29/06/2011</td>
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<td>Researcher:</td>
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### Objectives

Produce, write and edit a national newsletter for effective communication, networking and transfer of information in the Australian Asian vegetable and food industry.

### Background

The circulation of the ‘Access to Asian Foods’ newsletter is a key part of RIRDC’s New Industries, New Plant Products, Cultural and World Foods Program. The newsletter is a mechanism for adoption of outcomes from the latest market and scientific research. The newsletter serves as a focal point so that the industry’s inherent diversity does not work against it. The newsletter spreads new information, covers multiple topics on many crops and keeps groups in contact.

### Research

A two-page newsletter document called “Access to Asian Foods” was produced bi-monthly in the period July 2009 to June 2011 and included reports and information on Asian vegetables and food.

Newsletters were also coordinated and aligned with publishing dates of AUSVEG’s magazine ‘Vegetables Australia’.

### Outcomes

Six newsletter issues were supplied to RIRDC. The project also involved coordinating the translation of the newsletter into Cambodian, Chinese and Vietnamese and liaison with the editor of the magazine ‘Vegetables Australia’ for AUSVEG the national peak industry body for vegetable and potato growers.

### Publications

Six newsletters
Completed Projects - Cultural and World Foods

PRJ-003686  Identify the agent causing rot in *Tuber melanosporum* and management controls

| Start Date: | 26/06/2009 |
| Finish Date: | 29/06/2011 |
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| Fax: | (08) 92441746 |
| Email: | harry@wineandtruffle.com.au |

**Objectives**

This project aimed to discover the key issues that contribute to the initiation and formation of rot in truffles. During the 2009 truffle production season (May to September) a specific focus was applied to the truffles that were found to have part and full rot. These truffles were analysed and data collected to allow some meaningful statistics to be collected on this problem. Additional objectives were:

- Document literature review and outline current thinking on truffle rot.
- Identify factors contributing to the premature loss and rot of truffles.
- Describe management options available to minimize truffle loss.
- Increase the salable harvest and profitability of truffle cultivation.

**Background**

Truffle production is a new and rapidly growing industry in Australia. Current production is estimated at around 1.7 tonnes, but this is expected to increase to between five and ten tonnes in the next three years as existing plantations mature. The vast majority of production is exported to existing international markets where the Australian product fills demand during the northern hemisphere off-season. Success of this promising new industry however, has been severely hampered by severe pre-harvest losses to a problem known as truffle rot.

Truffle rot is reported to occur in Western Australia, New South Wales and Tasmania. Losses to the problem are estimated to account to 35% of the national harvest, representing a potential loss of revenue of $1.8 million in the 2010 season alone. This project present the findings from a preliminary study into the cause/s of truffle rot and potential management options capable of minimising its impact.

**Research**

This study was conducted over two truffle seasons in 2009 and 2010. During the first season, data were collected on the occurrence of rot in the field along with observational records. An extensive literature review was undertaken to compare these preliminary findings in Australia with experience elsewhere. From this, a list of possible rot causing factors was identified and this was used to guide the experimental work conducted in the second year.

Using healthy and unhealthy truffles from WA at various stages of maturation, a range of bacterial and fungal cultures were isolated using standard techniques. The number and diversity of naturally occurring bacteria (including epiphytes and secondary pathogens) found within the unhealthy truffles made it impossible to identify all of the isolates collected. Therefore, isolates were screened, in groups, for rot-causing ability in a field based inoculation trial. From this it was hoped that any potentially pathogenic organisms might be found. Morphological assessment of fungal strains showed little constancy between samples, and were rarely isolated from the disease front, therefore fungi were eliminated from
Environmental stimuli of the problem were tested in the field, with management based treatments. The effect of irrigation frequency, soil temperature and recovering of exposed truffles were chosen as the most likely treatments to deliver viable strategies for rot management.

**Outcomes**

Results showed that truffle rot was far more prevalent in truffles which had formed at the soil surface and become exposed during the course of development. At the study site, over 98% of all truffles were found in the top 5 cm of the soil profile. Thus increasing the depth of truffle formation may present a mechanism for control of the problem.

**Implications**

These results provide preliminary data towards identifying the cause of truffle rot. While the exact cause remains unknown it is clear that environmental factors, are involved in rot development, which could provide mechanisms for its control. However more work is required to confirm these findings before definitive recommendations can be made to growers.
Completed Projects - Cultural and World Foods

PRJ-003601 Taking stock of the Australian Asian vegetable industry

| Start Date: | 24/06/2009 |
| Finish Date: | 01/09/2010 |
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| Organisation: | Connectica International |
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| Email: | barrywlee@ozemail.com.au |

**Objectives**
To review and analyse the current situation in the Australian Asian vegetable industry and assess the sustainability of the industry and future direction priorities.

**Background**
Asian vegetables have been seen as a specialised niche, the preserve of small market growers catering for Australians of Asian descent. In general, the growth of demand for Asian vegetables has been attributed to the recent growth in the number of immigrants from Asia. However, more recently there has been recognition that Asian vegetables are becoming an increasingly important part of the Australian diet. Nowhere is this reality more evident than on supermarket shelves where Asian vegetables have increased in both volume and variety.

RIRDC has supported the development of the Asian vegetable industry in Australia with its Asian Foods Research Program. In particular, RIRDC supported strategic reviews of the industry and these studies provided key information in identifying the priorities and research needs for the industry. This report builds upon these previous industry reviews and provides a baseline of information for the industry.

**Research**
The objectives of this study are to review and analyse the current situation in the Australian Asian vegetable industry and assess the sustainability of the industry and future priorities.

This study shall provide:

- A stocktake of the size and characteristics of the industry.
- Information critical to understanding the issues affecting industry productivity and sustainability.
- Key information for research planning by RIRDC and Horticulture Australia, and other Government agencies.
- Build upon key industry communications work with stakeholders including those growers with culturally diverse backgrounds.

**Outcomes**
The Asian vegetable industry has shown strong growth during the past 15 years, increasing in value from $50 million in 1994 to $204 million in 2008, according to Australian Bureau of Statistics figures. This represents about six per cent of Australia’s $3.4 billion vegetable industry.

This research suggests that increasing variety in Australian diets and an influx of Asian migrants have contributed to the growth in production, although demand has begun to slow and there is potential for market oversupply in future years. Since 2004/05 exports of Asian vegetables have also declined by 80 per cent.

Leafy Asian vegetables (such as Chinese cabbage, pak choy, choy sum, gai lan and kang kong) are the most significant Asian vegetable, by both value and volume, and were more than twice the value of other groups of Asian vegetables, such as spring onions and shallots or parsley and herbs. The growth of ginger production in Queensland has made it the largest producer of Asian vegetables by both value and volume of production, overtaking NSW.
Grower numbers have increased by 19 per cent between 2005/06 and 2007/08 to 1,414 growers, but this may not include smaller market garden growers. Growth in the industry has attracted hydroponic growers in addition to traditional market gardeners and large-scale commercial producers.

The cultural diversity of growers and production in peri-urban environments both remain challenges in improving farm practices, including chemical use and biosecurity issues.

Implications

There are now three groups of growers in the industry involving traditional practice market gardeners, commercial scale producers and hydroponic growers. While market gardeners may have difficulty with literacy, limited capital and occupy smallholdings, they nonetheless dominate the industry. Industry support and research has been effective in shifting many in the industry from traditional practices employed by first generation growers to modern commercial practices. Research should continue to focus on facilitating this transition. However, this focus should not be at the expense of those who have made the transition to commercial production and require constant innovation and productivity improvements to deliver product competitively to markets.

The future of the industry lies with the support of all three groups of growers. The sustainable growth of the industry needs to be based upon an approach which balances the commercial, environmental and social development needs of all parts of the industry. Industry and government need to develop sustainability policies which incorporate ways in which to most effectively engage with all growers in the Asian vegetables industry.
Completed Projects - Miscellaneous

PRJ-000003 Developing harvest technologies for *Cullen australasicum*

| Start Date:       | 01/09/2007        |
| Finish Date:      | 31/01/2011        |
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**Objectives**

Establish the suitability of Cullen to be harvested cost effectively utilising conventional cereal headers.

Identify best practice techniques for seed production of Cullen.

**Background**

*Cullen australasicum* has shown potential as a perennial legume pasture plant but this requires a cost-effective method of commercial seed production. The aim of this project was to determine a ‘best practice’ methodology for seed production and harvesting of Cullen.

**Research**

Cullen was harvested using a small plot harvester over three harvest seasons. Various treatments were tested to determine best practice methodology for seed production and harvesting. Treatments included harvest times, delayed harvest by trimming, pre-harvest swathing vs desiccation, seeding rate and plant density, and excluding pollination by honey bees. In addition to seed yield harvested, seed dropped prior to harvest was also measured.

**Outcomes**

Seed yields of over 700kg/ha were achieved without irrigation by early closure and flowering, pre-harvest swathing, and early harvest. To maximise seed yields an early closure and harvest is required to synchronise flowering and minimise seed losses. Seeding rates of 3-5 kg/ha of Cullen produced the highest seed yield over the three harvest years. Pollination and seed set of Cullen was effected without providing honeybees. Pre-harvest seed losses of over 800 kg/ha were measured in some treatments.

**Implications**

With early closure and early and timely harvest, low cost dryland seed production of Cullen is possible. However the risk of large seed losses exists with late and untimely harvest. Poor pod retention and indeterminate flowering remain as obstacles for reliable low cost seed production. However variation for these traits is known to exist, these constraints could be overcome through selection and breeding.

**Publications**

Completed Projects - Miscellaneous

PRJ-005698 Investigating alternative medicinal uses of a passionfruit hybrid

<table>
<thead>
<tr>
<th>Objectives</th>
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<tbody>
<tr>
<td>- To investigate the potential natural therapeutic properties of a unique passionfruit hybrid.</td>
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<tr>
<td>- Maintain and secure the genetic material at the trial planting at Duranbah, NSW.</td>
</tr>
<tr>
<td>- Develop a cooperative program with the Southern Cross University, Department of Natural and Complimentary Medicine to cost the detailed analysis required and develop time-frames for a full proposal.</td>
</tr>
<tr>
<td>- Contact potential commercial partners to assess prospects for commercialisation.</td>
</tr>
</tbody>
</table>

Background

During the breeding work to develop a better rootstock for the Australian Passionfruit Industry, two parent lines, *Passiflora incarnata* and *Passiflora edulis* var. *Flavicarpa* were crossed. The progeny, the F1 hybrid, while vigorous and virus free did not produce fertile fruit and was therefore unsuitable for use as a rootstock source.

Examination of commercially available herbal medicines for anxiety and stress relief revealed that the Passionflower *P. incarnata* was commonly used as a major component. There was an opportunity to determine if the hybrid contained similar health/medicinal properties as the Passionflower parent, and if so, the exceptional vigour of the plant compared to the Passionflower, could provide a new alternative enterprise to Australian growers and offer export opportunities for an ever expanding world market for natural medicines.

Research

Following the initial analysis in 2007 using high performance liquid chromatography, a further 10 plants of the same cross were tested to determine the degree of variability within the F1 population. This was necessary to ensure genetic consistency in the sample trial block vines prior to the detailed analysis project commencing in 2011.

The ten hybrid samples displayed a very high degree of consistency in terms of their chemical profile.

The chemical profiles of the hybrid samples were also substantively similar to that of the pharmaceutical grade reference material in that all the major compounds appear to be the same. Some quantitative differences are evident, as would be expected, and these differences are no greater than what is commonly observed between different batches of the same species.

Outcomes

These preliminary results suggest that leaf material from the hybrid *Passiflora incarnata x edulis var. Flavicarpa* has a chemical profile that is substantively similar to that of pharmaceutical grade *P. incarnata*. 
Completed Projects - Miscellaneous

PRJ-005518  The potential to produce processing pumpkin seed in northeast Victoria

Start Date: 01/06/2010
Finish Date: 29/06/2011
Researcher: Gary Baxter
Organisation: Tobacco & Associated Farmers Co-operative Limited
Phone: (03) 5752 1800
Fax: (03) 5752 1827
Email: gary@tafco.com.au

Objectives
The broad aim was to report on the Processing Pumpkin Seed industry per se but with a particular focus on the capacity for production in Northeast Victoria.
The project identified issues that may be impediments to future production and propose a best-bet approach for the way ahead.
Given that part of the project specifically related to Northeast Victoria, there was also an underlying objective to rebuild farmer confidence and improve the capacity of landowners to assess the potential of ‘new’ opportunities. It is therefore clear that the project had a role in increasing knowledge in order to maintain a strong social cohesiveness across the Valleys of the Upper Ovens, King and Kiewa River systems. There was also an opportunity to address practices that impact on land use viability and sustainability as farmers seek ‘new’ land use options.

Background
The use of pumpkin cultivars specifically for the harvest of edible seed is not common in Australia. However, packaged pumpkin seeds, pepitas and other pumpkin seed products such as pumpkin seed oil and seed meal are available in Australian supermarkets, health food shops and specialty food shops. One Australian family company has been using edible hull-less pumpkin seed to produce a variety of value added products.

Research
High quality edible hull-less pumpkin seed suitable for various value adding processes was produced from a semi-commercial production demonstration block at Myrtleford in North East Victoria. Field production and post harvest processing techniques were assessed. Opinions on various aspects of production and processing have been offered.

Outcomes
The production of edible pumpkin seed is theoretically feasible in Australian conditions. The semi commercial demonstration block at Myrtleford in North East Victoria also confirmed this from a practical perspective. The question relating to whether pumpkin seed production is a viable pursuit for Australian producers remains unanswered. A desire by consumers to ‘Buy Australian’ would be a logical consumer-led impetus to an Australian production industry in the short term. Initial modelling based on the production methods tested in this study would indicate a production cost of $6 to $60 per kilo depending on site and size of operation.

Implications
Maximising seed yield and particular seed quality attributes would be critical for a viable Australian pumpkin seed production industry. Cultivars specifically bred for the production of edible pumpkin seed are available in some countries. Interaction with key international experts would be essential to fine-tune various aspects of production and processing.
Research in Progress - Native Foods

PRJ-005135 Changes in quality (bioactivity) of native foods during storage

<table>
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<tr>
<th>Start Date:</th>
<th>30/05/2010</th>
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<tr>
<td>Finish Date:</td>
<td>30/05/2013</td>
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<tr>
<td>Researcher:</td>
<td>Yasmina Sultanbawa</td>
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<tr>
<td>Organisation:</td>
<td>The University of Queensland</td>
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**Objectives**

- Investigate the current handling practices, processing, packaging and storage of whole and processed native foods.
- Conduct a storage trial with the current practices of the industry to determine losses in quality and bioactivity.
- Develop and evaluate novel approaches for assuring quality (retention and stability of bioactives) in native foods during value addition.
- Study storage stability of bioactivity (antioxidant, antimicrobial and flavour profiles) and identified markers to ensure a product with consistent quality.
- Develop protocols with optimised conditions for handling, processing, packaging and storage.

**Current Progress**

Storage study on dried commercial herbs and spices Tasmanian pepper leaf, lemon myrtle and anise myrtle revealed a significant loss (>85%) in major volatiles under industry packaging and storage conditions. Milling of the whole dried leaf resulted in a loss of 35-45% of the volatiles in all three herbs. High barrier property packaging material and vacuum packaging reduced loss of volatiles to 25%. An improvement in the antimicrobial activity with the change of packaging material was observed but there was no significant change in antioxidant activity.

Commercial frozen halves of Davidson’s plum (Davidsonia pruriens) indicated stable total phenolics and antioxidant activity (FRAP) levels and antimicrobial activity over the 6 month storage period. Improvements to freezing and packaging of the halves resulted in a reduction in the drip loss over the 6 month storage period. Total Phenolics and FRAP values of highland Davidson’s plum was significantly higher than lowland plum.

Commercial dried quandong halves revealed an increase in total phenolics, FRAP and volatiles over the 6 month storage period. There was an increase in total phenolics and FRAP values at higher drying temperatures from 40°C - 60 °C and reduced drying times.

For commercial frozen whole Kakadu plums, total phenolics, FRAP and volatiles reduced during the six month storage period.
## Research in Progress - Culinary Herbs, Spices & Beverages

**PRJ-000420 Commercialising cocoa growing in north Queensland**

| Start Date:       | 01/07/2007 |
| Finish Date:      | 30/04/2012 |
| Researcher:       | Yan Diczbalis |
| Organisation:     | The State Of Queensland Acting Through The Department of Employment, Economic Development and Innovation |
| Phone:            | (07) 4064 1128 |
| Fax:              | (07) 4064 2249 |
| Email:            | yan.diczbalis@dpi.qld.gov.au |

### Objectives

This Project is focused on supporting development of a new commercial cocoa industry based in North Queensland. The project has three main components:

- facilitate, support and monitor Cadbury Schweppes (CS) linked pilot commercial cocoa plantings.
- general industry development activities/support including publication of an Australian Cocoa Growing Guide.
- Support to non CS-linked growers including Cocoa Australia (CA) linked growers and to CA management/proprietors.

In association with the first component another objective is to further evaluate existing and new planting material (yield and general performance) in commercial plantings and test the commercial viability for production of ‘commodity’ cocoa.

The overall objective from all activities is to reduce risks to participants in the emergent industry and increase the likelihood of a viable cocoa industry becoming established in North Queensland whether for commodity or ‘niche’ markets.

Furthermore, performance of the project will provide on-going engagement with the emergent industry. This will result in an awareness of technical and structural issues which arise so that they can be addressed or strategies developed.

### Current Progress

The project continues to support the establishment and production of cocoa on three farms in the Innisfail district and support regional industry development including offering support to growers in the Mossman region. The three producing sites in the vicinity of Innisfail were adversely affected by Cyclone Yasi in early February. The bulk of trees suffered severe leaf loss and up to 20% of trees were blown over or were on a severe lean following the cyclone. Recovery has been slow, particularly in two of the smaller sites, where wet conditions following the cyclone prevented disease management from being undertaken. Noel Stevenson, an Innisfail based grower, continues to expand his plantings since the cyclone with new plantings intercropped with banana.

Bean fermentation and drying research and development activities have ceased following Cyclone Yasi and are not expected to recommence until late 2011. Mr Noel Stevenson, the leading cocoa grower in the Innisfail region has recently visited “Cacao Cucina” (www.cacaocucina.com) in Florida to view and purchase bean to bar chocolate making equipment.

Daintree Cocoa is currently harvesting and fermenting cocoa pods produced in the Mossman region. Trial chocolate making is underway as a precursor to commercial release.
### Research in Progress - Culinary Herbs, Spices & Beverages

<table>
<thead>
<tr>
<th>PRJ-005474</th>
<th>Australian saffron: Commercialisation of processing technology and aroma analysis</th>
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<tbody>
<tr>
<td><strong>Start Date:</strong></td>
<td>30/04/2011</td>
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<td><strong>Finish Date:</strong></td>
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<tr>
<td><strong>Researcher:</strong></td>
<td>Robert Menary</td>
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<tr>
<td><strong>Organisation:</strong></td>
<td>University of Tasmania</td>
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<td><strong>Phone:</strong></td>
<td>(03) 6226 2723</td>
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<td>(03) 6226 7609</td>
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<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:r.menary@utas.edu.au">r.menary@utas.edu.au</a></td>
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</tbody>
</table>

#### Objectives

The overall objective of this project is to facilitate the consistent production of premium quality saffron spice by the Australian Saffron Industry.

Specific objectives will include:

- The design of a handling and processing system for achieving optimum quality.
- The commercial scale trial of the system in collaboration with industry partners and their contracted growers, followed by modification where necessary.

#### Current Progress

During saffron harvest (April-May 2011) processing trials were conducted over 10 days in the laboratory and five days onsite on the farm. Ongoing analysis of the spice quality is being correlated to logged conditions.
**Research in Progress - Fruit, Vegetables & Nuts**

<table>
<thead>
<tr>
<th>PRJ-003302</th>
<th>Improving seed sprout food safety: a farm to retail assessment</th>
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<tbody>
<tr>
<td><strong>Start Date:</strong></td>
<td>15/06/2009</td>
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<tr>
<td><strong>Finish Date:</strong></td>
<td>30/07/2012</td>
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<tr>
<td><strong>Researcher:</strong></td>
<td>Andreas Kiermeier</td>
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<tr>
<td><strong>Organisation:</strong></td>
<td>The Minister for Agriculture, Food &amp; Fisheries acting through South Australian Research &amp; Development Institute</td>
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<tr>
<td><strong>Phone:</strong></td>
<td>(08) 8303 9313</td>
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<td>(08) 8303 9424</td>
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<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:Kiermeier.Andreas@sa.gov.sa.gov.au">Kiermeier.Andreas@sa.gov.sa.gov.au</a></td>
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</table>

**Objectives**
The objective of this project is to improve food safety of alfalfa seed sprouts available for sale to consumers and to facilitate the development of the seed sprout industry.

**Current Progress**
Harvesting lucern has been delayed due to rain. Consequently, the collection of seed samples (before and after cleaning) to assess the microbiological effectiveness of seed cleaning has also been delayed. We are contacting the seed cleaners in Keith and Booborowie on a weekly basis.

The experimental design for the decontamination work using Calcium hypochlorite, Tsunami or heat has been agreed at a teleconference on 21 February 2011. We have sourced all the materials (seed, Tsunami and Calcium hypochlorite) and the first decontamination trial (using Calcium hypochlorite) is scheduled for the week starting 2 May 2011.

A trial has been undertaken on the effect of soak seed in relation to total viable counts (TVC). This work has shown that little (if any) growth occurs in TVC within eight hours when soaked at room temperature, though a 100 fold increase occurs by 24 hours.
### Research in Progress - Grains & Pulses

**PRJ-004225 Quinoa as a new crop in Australia**

<table>
<thead>
<tr>
<th>Start Date:</th>
<th>23/09/2008</th>
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<tbody>
<tr>
<td>Finish Date:</td>
<td>17/07/2012</td>
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<tr>
<td>Researcher:</td>
<td>Jon Clements</td>
</tr>
<tr>
<td>Organisation:</td>
<td>University of Western Australia</td>
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<td>Phone:</td>
<td>(08) 64881342</td>
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<td>Email:</td>
<td><a href="mailto:clem@cyllene.uwa.edu.au">clem@cyllene.uwa.edu.au</a></td>
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**Objectives**

- To determine the most likely regions suited to quinoa growing across Australia.
- To generate interest and exposure of quinoa to growers in Australia.
- To explore market potential through project involvement and feedback with a commercial partner.
- To select quinoa germplasm accessions that perform well across all regions or lines with specific adaptation via time of sowing field assessment.
- To select quinoa germplasm that are suited to either Mediterranean or cooler climate growing conditions and with winter versus summer growth adaptation.
- To determine the typical protein content of quinoa grown in Australia as derived from contrasting environments.
- To select lines that have low saponin that would either be suited to cultivar status or could be used for future breeding purposes.

**Current Progress**

Quinoa genotypes were included in field trials grown at four sites (Morowa, Perth, Narrogin, Manjimup) in WA during the 2010 growing season. Due to very low rainfall generally during the 2010 season in Western Australia, genotypes produced no yield in Morowa. There were significant differences among genotypes, revealing some genotypes that produced some yield under very low rainfall conditions. High temperatures at flowering are very detrimental to yield. Overall the seed increase from these trials was much lower than was expected for supply of a wider range of sites in 2011. However, enough seed of 10 genotypes has been generated for field trials at five sites in WA in 2011. An additional 100 germplasm accessions from the US Department of Agriculture have been requested. Collection site latitude and longitude data for approximately 70 quinoa accessions have been sourced and additional data is being sought in order for the ecogeographical study to be comprehensively undertaken and completed. Further refinement of the land suitability mapping is underway. Quinoa is indicated to be widely adapted. A project variation is requested that includes forward dating milestones by one year and visit by Professor Sven Erik Jacobsen visiting Australia, 2011.
## Research in Progress - Cultural and World Foods

**PRJ-006902**  Planning and communication towards the establishment of Seaweeds Australia as an R&D information hub for the industry

| **Start Date:** | 23/12/2010 |
| **Finish Date:** | 15/11/2012 |
| **Researcher:** | Pia Winberg |
| **Organisation:** | University of Wollongong |
| **Phone:** | (02) 4429 1522 |
| **Fax:** | (02) 4429 1521 |
| **Email:** | pia@uow.edu.au |

### Objectives
To facilitate the development of a new plant industry of commercial potential for Australia by putting formal structures in place for the management and communications for Seaweeds Australia.

### Current Progress
The International Conference for Seafood & Health was held in Melbourne during 7-10 November, and the New Rural Industries Australia Conference at the Gold Coast from 28-30 November. Seaweeds Australia members delivered oral presentations and hosted booth exhibitions. Over 15 applied seaweed R&D or industry outcomes by members were on show, including initiatives at the University of Wollongong Shoalhaven Marine & Freshwater Centre, James Cook University, Marinova Pty Ltd, Abtas Marketing Pty Ltd, government initiatives by RIRDC and the Department of Primary Industries, Fisheries Victoria, and a 2010 Nuffield Scholar Adam Butterworth. Both exhibitions were formally reported on in the RIRDC travel reports PRJ-006783.

Progression towards the establishment of a Seaweeds Australia network, website and newsletter/blog.

Following national conferences and the release of the first newsletter, the Seaweeds Australia stakeholder network has grown from the original 30 stakeholders to over 90 stakeholders and includes interests in harvesting technology, fine foods, agricultural applications, cosmetics and further health and nutrition.

A website server and content management system has been identified and a website design is underway.
Objectives

The primary objective of this study is to define the aroma profile (measureable volatiles) of a good Australian black truffle (Tuber Melanosporum).

Secondary objectives are to

- Define the aroma profile (measureable volatiles of a rotten truffle)
- Investigate and quantify the differences in the volatile profile of Australian Black truffles grown in different regions
- Investigate the volatile profile as it changes over time
- Conduct a preliminary study of differences in volatile profile of truffles stored at different temperatures.
- Suggest an aroma profile for grading purposes

Current Progress

This project is on target. Truffles were sourced from Western Australia, NSW, Tasmania and the ACT. A solid phase microextraction (SPME)-GC-MS method was developed using a SPME fibre with a combination of divinylbenzene, carboxen and polydimethylsiloxane stationary phases.

The volatile profiles consisted of mainly a mixture of esters, alcohols, aldehydes and dimethyl sulphide (specifically 2-methylbutanal, 3-methylbutanal, dimethylsulfide, 2-methyl-1-propanol and 1-octen-3-ol). Interestingly WA truffles showed high levels of formic acid esters and this appears to be unique as these compounds have only been identified as minor components in truffle volatiles from other parts of the world. Further investigation is needed to confirm these results.

The evolution of truffle aroma was investigated with a series of immature truffles sourced monthly from Manjimup, WA. The volatiles will be correlated with the ages of these truffles. Presently 10 immature truffles have been analysed.

A sensory analysis to develop quality scales for identified aroma parameters has been conducted.

The study consist of the following components:

- Description of truffle’s aroma with the help of Truffle Experts and Chefs
- Recruitment and training of panel using Aldehyde C-14, Benzaldyhyde, 2-methylbutanol, Butyric acid, Guaiacol and Vanillin).
- Sensory Analysis

The panelists have been trained and preliminary studies on 2011 truffles have concluded. The study is awaiting fresh truffles in 2012 to continue organoleptic analysis.
Investigation of factors to improve black truffle yield

Start Date: 30/05/2009
Finish Date: 30/04/2013
Researcher: Celeste Linde
Organisation: Australian National University
Phone: (02) 6125 7682
Email: celeste.linde@anu.edu.au

Objectives

To investigate the genetics of truffle strains used in Australia, in an attempt to identify a possible cause for low truffle yields in Australian truffieres. Truffle samples will be collected from trufferies in the ACT, NSW and WA as well as truffle nurseries in Tasmania and WA to assess truffle genetic diversity and truffle mating type distribution.

1. Assess genetic variability and mating type distribution of Tuber melanosporum.

Low genetic diversity in truffles would limit their capability to form productive associations with a wide range of tree species and genotypes as well as with site interactions. The genetic diversity of Périgord truffles in Australia will be determined from truffle nurseries as they are the source of truffles in the rest of the country. The genetic diversity of Australian truffles will be compared to truffles in eg France (published data) to assess whether the Australian truffles are possibly suffering from a large genetic bottleneck impairing its ability to produce large truffle yields.

Uneven distribution of mating types of truffles will result in the truffle not being able to find a sexual partner to interact with and produce truffles. Now that we will have genetic markers available, we can test for the first time for the quality of truffle inoculum produced on trees providing a major step forward in improving the truffle industry in Australia.

2. Determine host-genotype-interactions between truffle and host genotypes.

Most fungi and their trees interact in a specific way resulting in various levels of subsequent fungus growth, depending on the specific interaction. It is very likely that specific interactions also exist in black truffles and their tree hosts.

Current Progress

1. The genetic diversity assessment has been successfully completed. However, mating type analyses were delayed due to pending patents of truffle mating type loci, resulting in delays in releasing the information by the European truffle research group, information which is critical to perform mating types testing. Mating type information has now been released, although the patent application is still in progress.

2. Host-genotype-interaction research was terminated in favour of research on the presence of Tuber brumale in truffieres in Australia.

In short, lack of genetic diversity does not appear to negatively impact on truffle production. Truffle host trees poorly infected with truffle inoculum, could however, play a role in low yield of truffieres.
PRJ-003853  Broad scale implementation of native grass germination enhancement technologies

Start Date: 23/09/2008
Finish Date: 30/11/2012
Researcher: Kingsley Dixon
Organisation: Botanic Gardens and Parks Authority
Phone: (08) 9480 3614
Email: kdixon@bgpa.wa.gov.au

Objectives
The overall aim of this proposed study is to improve opportunities to introduce native grasses, through developing and testing techniques, allowing for the rapid scaling-up and sowing of native grasses on a broad-scale.

Lower establishment costs associated with increased germination performance will result in the greater use of native perennial grasses in pasture systems in the low/medium rainfall regions of southern Australia.

Current Progress
Seed cleaning has been focussed on techniques that can remove surrounding structures, wholly or in part without compromising the viability of the embryo. Acid scarification (commonly used to alleviate hard seediness in legumes) has been trialed with various levels of success. M. stipoides appears to be very susceptible to acid treatment when germinated under controlled environment conditions however low concentrations of acid are showing promise with no negative effects on overall seed germination performance. However it is yet to be determined if this technique will facilitate better handling by sowing and cleaning equipment. This will be tested in the Spring field trials 2011.

Seed priming techniques to increase stress tolerance under field conditions have been completed in both Victoria and WA.

Native Seeds continues to develop seed cleaning and priming (soaking and drying) technologies.

Re-establish the autumn field trials in WA, Victoria and NSW.

With a late start to the season in WA, and seed treatment techniques being further refined, it has been decided to establish larger trials in Spring 2011.
Research in Progress - Miscellaneous

PRJ-004777  *Cullen australasicum* – overcoming a limitation towards its commercial success

| Start Date:  | 30/05/2010 |
| Finish Date: | 31/03/2013 |
| Researcher:  | Alan Humphries |
| Organisation:| Future Farm Industries CRC Ltd |
| Phone:       | (08) 8303 9651 |
| Email:       | Alan.Humphries@sa.gov.au |

**Objectives**

This proposal addresses the second objective described as a “stop/go” point within the current RIRDC project “0003 Developing harvest technologies for *Cullen australasicum*”. The focus of this initial research has been to identify and develop effective harvesting methodologies to maximise seed yields. Research to date using germplasm of a single accession (SA 4966) has identified techniques (e.g. windrowing) to achieve this. However, reducing seed loss by dehiscence still remains a major constraint to achieving low cost seed, with seed yields equivalent to lucerne of > 1t/ha achievable if dehiscence was negligible. For *Cullen* to be adopted we need to ensure that seed prices are acceptable to producers and that a viable seed industry is developed. This proposal will help resolve this issue through the identification of elite genotypes with improved production and harvestability characteristics as the basis for the development of a cultivar that can deliver competitively priced seed.

**Current Progress**

A replicated trial of 64 elite lines of *Cullen* was established at Urrbrae, at the University of South Australia. Each line with eight plants and four replications. All 512 plants were individually assessed to measure variability within and between lines for a range of morphological, flowering, and seed characteristics. Characteristics assessed were:

- Date of first flowering
- Plant Habit
- Leaf size and colour
- Plant leafiness
- Intensity of Flowering
- Seed Yield
- Pod Retention

All characteristics assessed except for pod retention showed a considerable variation between lines. A few lines also showed considerable between-plant variation, but most lines were quite uniform showing relatively little variation.

Mean date of first flowering ranged from 22 November 2010 to 13 January 2011. Visual assessments of whole plants and tagging individual racemes to identify plants with improved pod retention were largely unsuccessful, with most plants having poor pod retention. A few lines were found that appear to have slightly better pod retention and these individuals will be scrutinised closely again next season.

Excellent seed yields were recorded on some lines despite the late harvest and incidence of pod dehiscence. Mean seed yield of lines ranged from 6 to 70 gms per plant or 55 to 680 kg/ha on 23 February with an estimated average seed drop of 365 kg/ha.

The harvesting of *Cullen* was cut off in early April, and will be assessed for winter forage production before the next season of flowering and seed production in 2011/2012.
Objectives

- Review existing knowledge of plant selection and performance for extensive green roofs and living walls.
- Develop regionally specific plant species selection matrices for extensive green roofs and living walls in Australia.
- Use selection matrix criteria to generate lists of plant species, including ornamental and productive natives, that are generally considered to be suited to regions and applications.
- Establish and evaluate plants on a proof-of-concept demonstration living wall and extensive green roof.
- Communicate outcomes with key stakeholders via an application focused plant improvement workshop.

Current Progress

Plantings of six species (five Australian native species and one Sedum species as a comparator) have been established on two pilot-scale green roofs. Plantings of a further six Australian native species have been established in four green wall modules. Data is being collected on plant survival rates, growth rates, canopy temperatures and internal roof/wall temperatures.

Midday canopy temperatures of green roof plants were found to differ by up to 10°C between species on a hot summer day, indicating the importance of species selection in providing thermal benefits to buildings. Furthermore, peak internal roof temperatures were up to 20°C lower for the green roofs than the control (Colorbond steel) roofs during this season.

The literature review is under continual revision as new information is being rapidly generated in this area. The document will be presented for discussion at the upcoming Green Roof and Living Wall Workshop (UQ Gatton in mid-July) to ensure that it includes the most up-to-date industry knowledge.

Plant selection matrices have been prepared for three climatic regions in Australia and these are currently being refined into a user-friendly interactive spreadsheet. The ensuing fact sheets will be distributed at the workshop.
PRJ-005065  Processing seed of selected low-input native grasses for commercial adoption

Start Date: 01/06/2010
Finish Date: 31/10/2012
Researcher: Kendrick Cox
Organisation: The State Of Queensland Acting Through The Department of Employment, Economic Development and Innovation
Phone: (07) 40919324
Email: Kendrick.Cox@deedi.qld.gov.au

Objectives

For two elite ecotypes each of five key native rangeland grass species, with demonstrated high potential for crop-based seed production in north Queensland:

1. Expand seed production of selected ecotypes of all grasses in the program and assess the impact of best-practice harvesting methods (combine, brush or other) on seed flow and viability.

2. Assess methods of seed processing to minimise viability loss while enabling flow through planters used to establish native grasses in rangelands and seed crops.

3. Assess establishment performance and forage quality under conditions typical of seed production and end use. Use best practice seed treatments for dormancy where necessary.

4. Promote the adoption of best practice methods. Build a committed ‘problem solving and commercial adoption group’ utilising DEEDI, university and commercial seed processing facilities and expertise.

Current Progress

Progress was variable. All crops were harvested with multiple harvests for Queensland blue and blackspear grasses. However, cyclonic winds (Yasi) temporarily damaged all seeding crops. Effective commercial-scale methods for processing blackspear and kangaroo grasses have been developed plus a promising method developed for Queensland bluegrass (seeds to be tested). Blackspear grass seeds were successfully row planted, but we are yet to overcome seed dormancy problems with kangaroo grasses – one pre-basic pre-commercial crop was established vegetatively. Harvested cockatoo grass seeds contained a high proportion of empty florets. Planned field establishment trials have been rescheduled for October.
NEW PLANT PRODUCTS

RIRDC Publication No. 11/148

The New Plant Products, Completed Projects in 2010-2011 and Research in Progress at June 2011 contains short summaries of projects funded by the program. The New Plant Products Program aims to facilitate the development of new and emerging industries based on plant or plant products that have commercial potential for Australia.

The New Plant Products Program is divided into seven categories. These areas are:

- Native Foods
- Culinary herbs, spices and beverages
- Extractive and fibre crops
- Fruit, vegetables and nuts
- Grains and pulses
- Cultural and World Foods
- Miscellaneous

RIRDC is a partnership between government and industry to invest in R&D for more productive and sustainable rural industries. We invest in new and emerging rural industries, a suite of established rural industries and national rural issues.

Most of the information we produce can be downloaded for free or purchased from our website <www.rirdc.gov.au>.

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Cover photo: Harvesting cocoa pods

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