Indigenous Food Research Park

Native grains update – January 2023

Welcome, welcome, welcome!
Hello 2023! We hope that this is the start of a terrific year for everyone.

Welcome to Hannah Binge the newest member of the IFRP-Native Grains team! *Yaamanda Hannah!*

The awesome IFRP-Native Grains team from Narrabri. From left to right: Hannah, Kerrie, Di, and Angela.

From Gamilaraay and Yuwaalaraay country
The IFRP-Native Grains team based in Narrabri have been focussing on finishing the threshing tests for the AgriFutures Threshability Project. The most surprising outcome has been the specificity of method for each species. Highly domesticated crops as genetically diverse as wheat, chickpeas, and canola, can all be threshed with the same equipment if the settings are optimised. However not only do few of the native grasses thresh well in the same equipment as domesticated crops (e.g., threshing drums followed by aspiration), but the methods they require also vary widely from stone grinding to chopping to mulching. We look forward to releasing the final report which will not only make recommendations as to what equipment/methods are best for each species, but also why this is the case. The report plus videos and a quick reference guide will be released in April next year.

We are often asked about the species with which we are currently working. Below is a summary table of the main species we use, however there are others. Unless mentioned in the table, all the species have evidence of being used by Indigenous people.

We are also attempting to work with Tall Oat Grass (*Themeda avenacea*) which is closely related to Kangaroo Grass (*Themeda triandra*) but is taller and has larger seed. However, it poses the same difficulties for threshing as Kangaroo Grass and yields can be very poor with many empty florets. Some of the desert grasses such as *Eragrostis* spp. and other grasses with limited natural range such as

Channel Millet (*Echinochloa turneriana*) were also harvested and eaten by Indigenous people but are difficult to obtain bulk seed.

Common name	Species	Reason why	Notes
Native Millet	*Panicum decompositum*	Good yield, very easy to process	
Arm Grass Millet	*Brachiaria milliformis*	Good yield, good taste	
Curly Mitchell Grass	*Astrebla lappacea*	Good yield (but only in good seasons), excellent taste and nutrition	Other *Astrebla* spp. may be more suitable however bulk seed is difficult to obtain
Weeping Grass	*Microlaena stipoides*	Interest from food industry	Relatively few examples of historic consumption by Indigenous groups
Purslane	*Portulaca oleracea*	Good yield, multiple uses for the whole plant	Difficult to harvest mechanically but very easy to process
Old Man Saltbush	*Atriplex nummularia*	Good yield, does not require complete threshing before consumption in intended market	Other saltbushes also have seed of interest but are difficult to obtain in bulk quantities
Spiny Mat Rush	*Lomandra longifolia*	Excellent yield potential, easy to thresh	Food safety is likely but unconfirmed

We are not working with the acacias, native rices, or Kangaroo Grass as they are being researched in collaborations with Indigenous people at other universities. We highly recommend you search for these projects on the internet – there is some great stuff happening!

Native grains in different settings. Left: Tall Oat Grass regenerating after bushfires in 2020; right: whole plants of Purslane for sale in local grocery setting.

Events and happenings

In mid-November 2022, the IFRP-Native Grains team based in Narrabri hosted a Networking Session for the surrounding communities. The day began with a morning tea including foods made with Native Grains – savoury and sweet biscuit, also different cakes cooked by the IFRP-Native Grains team. We

had approximately 30 people who attended including people from surrounding Indigenous communities, local farmers, and other interested parties such as LLS and member from National Parks and Wildlife Service. Members of the IFRP-Native Grains team based in Sydney joined in virtually for the afternoon session, but we missed out on all the delicious food. ☹

Angela Pattison gave a warm welcome with introductions and an overview of what we are doing and hoping to achieve for the day. Les Knox was invited to give Welcome to Country and Mayor Ron Campbell provided an Acknowledgement.

The group moved to the threshing shed and had the opportunity to see different threshing methods used for native grains. Kerrie used the blower vacuum to demonstrate how it is used to harvest and thresh Native Millet and how to use a sieve to separate the grain from the trash. Using a sheet of mesh, Di showed the group how to catch the grain of Tall Oat Grass and how easy it is to shake off any unwanted trash. Hannah demonstrated vacuuming and sieving techniques and use of the hand grinder to explain cleaning and milling processes used for Arm Grass.

The IFRP-Native Grains team in action. Top left: Di and Angela demonstrating threshing and grain sorting; top right: Kerrie processing Tall Oat Grass; bottom left: kids learning about native grasses from Di; bottom right: more learning happening at the NDCAS Youth Centre.

The group rotated through each demonstration then headed back to the conference room where Phil Stevens gave a presentation regarding the commercial sides of things. Following lunch, Herb Smith, Founder and CEO of Dreamtime Tuka, shared his business experience and the opportunities presented to him through native Australian ingredients. This was followed by an open discussion regarding farming and commercial costs of grain and food production. Overall, the day had a very positive sentiment, and it was encouraging to observe that attendees were actively sharing knowledge and ideas.

Thanks for the great report, Hannah!

Kim Bell-Anderson, a Sydney-based member of the IFRP-Native Grains team, along with Les Knox, were featured on the front page of the North Western Guide, the local newspaper, after this event.

As part of other events, we had fun cooking and sharing with the Young Einstein Club at Narrabri Library, and for the PBI Narrabri Field Day, Pulse of the Earth Festival in Bingara, at the NDCAS Youth Centre, and as part of the Wee Waa LALC Family Fun Day. Kerrie has also been involved with many things in Moree – check out the Yinnar-ma Facebook Page.

Student research projects – the variety of research done by our team

Tina Bell and Rosanne Quinnell supervised an Honours project done by Gemma Craig as part of her Bachelor of Science (Honours) degree. Congratulations to Gemma for achieving Honours Class I!

Native grains: morphometrics, nutritional considerations and the potential of XRF for plant screening

Gemma Craig

Staple cereal crops provide the majority of the daily caloric intake of the global population, yet they generally lack essential micronutrients. Enhancing the nutritional quality of wheat flour presents an opportunity to reduce micronutrient deficiencies worldwide. However, the sustainability of modern agroecosystems, centred around domesticated monocultures, has been challenged due to the environmental impacts and poor resilience to anthropogenic climate change. In light of this, Australian native grasses have re-emerged as locally adapted and potentially sustainable grain crops to supplement the nutritional profiles of wheat products. Cultivation of native grasses for grain on a commercial scale requires an understanding of their reproductive morphology. This study found that there is high diversity and variation in native grass inflorescences. This data will be useful in identifying and overcoming barriers to cultivation. While evidence has suggested native grains are more nutritious than cultivated wheat, the Fe and Zn content of these grains has not been quantified previously. This study used X-ray fluorescence (XRF) spectrometry, an emerging elemental analysis technique in plant biology, to measure the Fe content of a range of edible native grains. A protocol was designed to empirically calibrate a hand-held XRF device for the detection of Fe in native grass material and, through validation on reference grass samples, was shown to be highly precise. Elemental analyses revealed that the inflorescences of some native grasses contain substantially higher Fe levels than found in wheat grain; up to 75 times higher. The findings of this study reinforce the potential of native grains to positively impact human nutrition and improve the sustainability of Australia's agroecosystems.

Claudia Keitel and Floris Van Ogtrop supervised an Honours project recently completed by Arushi Vasrivastava as part of her Bachelor of Science and Bachelor of Advanced Studies (Food and Agribusiness) degree. Congratulations to Arushi for also achieving Honours Class I!

Biofortification of leafy greens in hydroponics with calcium, iron, zinc, and manganese is an effective method to eradicate micronutrient deficiencies in population

Arushi Vasrivastava

Leafy greens are the main source of micronutrients such as iron (Fe), calcium (Ca), zinc (Zn), manganese (Mn) and iodine (I). Micronutrient deficiencies are rising due to consumption of high-energy but nutrient-poor foods, and micronutrient-rich foods are not readily available in remote

locations of Australia. Biofortification of food in hydroponic systems can reduce micronutrient deficiencies and increase mineral uptake in the diet. Lettuce, pak choi, purslane and warrigal greens were grown for four weeks in hydroponic systems biofortified with Ca, Fe, Mn, and Zn. All biofortification treatments had significantly higher mineral content than controls, but biofortification presented signs of toxicity in all species except purslane. Purslane maintained good health and biomass and displayed good mineral uptake in response to treatments. Future studies are recommended to develop specific concentrations of mineral nutrients in hydroponic solutions for each species, which can help provide a regular supply of nutrient-dense leafy greens both in city centres as well as remote communities.

Tina Bell and Floris van Ogtrop supervised an Honours project recently completed by Giorgia Whincup as part of her Bachelor of Science and Bachelor of Advanced Studies (Food and Agribusiness) degree. Three for three, Giorgia also achieved Honours Class I for her project work – congratulations Giorgia!

Increasing germination potential of native food species and identifying optimal conditions for transfer to hydroponic setting

Giorgia Whincup

This study examined specific germination requirements for several native and naturalised Australian food species for optimised transfer and subsequent growth in hydroponic setting. Sustainable food production systems such as hydroponics, are becoming increasingly more important as they enable the development of indoor agriculture, an important factor which may contribute to future food security. Edible Australian native species are nutritionally valuable and represent a sustainable and novel group of plants of commercial significance. This study found that in vitro germination has an important role in ensuring successful transfer and optimal growth in hydroponic setting. Different germination treatments were preferred by native and naturalised species with native species requiring greater pre-treatment application and naturalised species successfully germinating with simple imbibition with deionised water. Similarly, age of seedling (indicated by date of transplantation) varied among native and naturalised species. These findings are of commercial significance as they establish criteria for successfully germination and subsequent transfer, promoting quicker growth cycles for hydroponic cultivation of native and naturalised species. This research demonstrates the viability of hydroponic cultivation of Australian native food species and identifies future steps required to commercialise them.

Coming up

The release of an RD&E plan for the native grain industry commissioned by AgriFutures and written by Black Duck Foods after industry consultation is due early next year.

Yalu!

The IFRP-Native Grain team

AgriFutures® Emerging Industries

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