

Woody perennials – not as tough as you may think



By Catriona Nicholls
Kondinin Group

The recent completion of the Rural Industries Research and Development Corporation (RIRDC) and Future Farm Industries CRC-funded *Direct seeding of woody crops* project has been somewhat of a myth-busting exercise according to project leader Dr Geoff Woodall, University of Western Australia (UWA).

“One of the key assumptions about native woody perennials has been that because they are indigenous plants, they are tough enough to establish in local conditions without too much support,” Dr Woodall said.

key points

- Supplementary nitrogen nutrition is of key importance to improving the reliability of direct seeding native woody perennials
- Seed placement in a stable soil environment at the right depth will increase establishment success
- Water harvesting is essential in dry environments
- Native woody perennials are at risk of attack from the same suite of pests and diseases as many more traditional crops.

“But our investigations have revealed that the reality is these fine-seeded plants need as much tender loving care as many of our more traditional crop species, such as canola.

Four eucalyptus species – *E. cladocalyx*, *E. loxophleba*, *E. polybractea* and *E. occidentalis* – were the main subjects studies, as they represent a group of plants practitioners have difficulty establishing from field-sown seed. The group also has considerable commercial potential and the findings are relevant to other eucalypts used in revegetation and biodiversity projects.

A series of laboratory experiments was used to investigate germination characteristics and the effectiveness of enhancement strategies. Pot trials were used to investigate general germination biology and numerous field trials were used to investigate herbicide responses, best-bet treatments and the interaction between site preparation and soil moisture.

Dr Woodall said that some of the key findings suggest that success with direct seeding will be greatest if soil nutrition (especially soil nitrogen) is optimal, seed is placed at the right depth in a stable soil environment that efficiently harvests water and pests, weeds and diseases are well managed during the early growth stages.

Nitrogen responses

It was the large differences in early growth between soils collected from sites that were

ultimately revegetated, that led Dr Woodall and his team to develop a working hypothesis that ‘nutrition may be of importance’.

“Direct seeding practitioners do not tend to use supplementary fertilisers when direct seeding native plants,” Dr Woodall said.

“The general view – including my own – was that our agricultural soils are nutrient enriched and native plants don’t require supplementary nutrition.

“However, in two soils collected from areas where commercial revegetation had been implemented, we observed a significant response to the addition of supplementary fertiliser.”

Further investigation revealed the response was due to the addition of nitrogen.

“Averaged across two mallee species, the addition of nitrogen in the form of ammonium delivered a greater than 10-fold increase in total plant biomass when compared with seedlings provided either a balanced nitrogen-free nutrient regime or given no supplementary nutrition at all – control plants watered with rainwater only,” Dr Woodall explained (see Figure 1).

“What was most impressive was that this increase occurred during a very short period – 34 days,” Dr Woodall said.

“The net result was the production of larger, more robust seedlings in a time-frame relevant to the short growing season available in the dryland agricultural regions of southern Australia.”

LEFT: Dr Woodall at trial site preparations in the WA wheatbelt. A stable soil environment that harvests water, accurate seed placement and sufficient soil nitrogen are critical to the success of establishing native woody perennials. (Photo: Dr Geoff Woodall)

Well placed for success

The project also highlighted why precision machinery and seeding depth is so important to the successful establishment of woody perennials.

“Good seed placement creates a stable soil niche,” Dr Woodall said. “We discovered the absolute importance of a stable soil niche for fine-seeded woody crops.

“These plants cannot stand up to any washing and blowing of the soil and success depends heavily on minimal soil movement post seeding.

“Eucalypts also have a low level of plasticity to sowing depth when compared with agricultural crops,” Dr Woodall said (see Figure 2).

“However, all fine-seeded species can be sown deeper than previously thought.”

As such, Dr Woodall recommends practitioners not use current and widely published rules of thumb to guide seeding depth.

“Sow eucalypts that have medium-sized seed (for example *E. cladocalyx* and *E. occidentalis*) at a depth of 10 millimetres in light-textured soils and at 5 mm in medium- to heavy-textured soils,” Dr Woodall said.

“If dry conditions prevail or are expected seed use, efficiency can be compromised and seeds sown at a depth of 15 mm.

“For fine-seeded eucalypts (for example *E. polybractea* and *E. loxophleba*) sow seeds at 5-10 mm in light-textured soils and 5 mm in medium- to heavy-textured soils.

Dr Woodall warns that these guidelines should not be used for myrtaceous species that require light for germination.

FIGURE 1. Eucalyptus species response to nitrogen

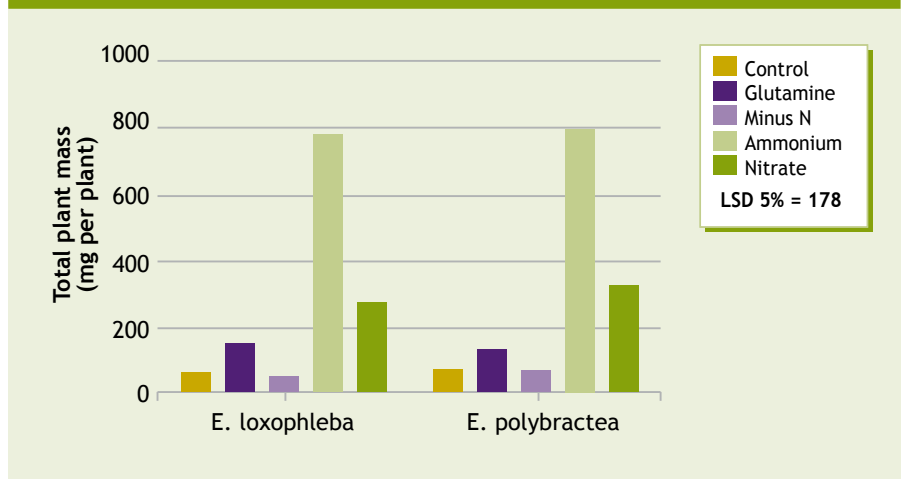
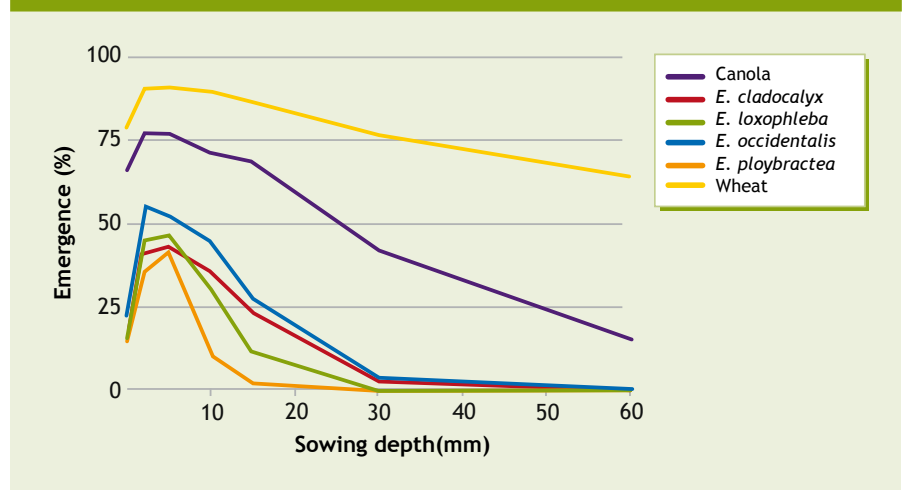


FIGURE 2. Effect of sowing depth on emergence



Protection a must

“The common position before the project was that native plants were quite robust,” Geoff said. “The key message from our research is that they’re very susceptible to the same suite of pests and diseases that cause problems in traditional crop establishment.

“Insect pests present in agricultural land were shown to cause major problems to all species we investigated.”

Redlegged earth mite (RLEM) was only one of many pests responsible for seedling damage and death, and tolerance varied greatly among species.

“Seedlings do eventually become robust when they reach the four-to-six leaf stage,” Dr Woodall.

Looking forward

While much insight has been gained throughout the project, Dr Woodall believes

the early results require fine tuning through further investigation.

“We’re not at the stage where we have a total agronomy package, instead we have ironed out a few of the key preliminary issues that determine success under field conditions.

“This project gives us a really strong backbone to go forward from here,” Dr Woodall said. “Not only to produce an economic establishment method for commercial-scale operations, but also for revegetation work and projects focussed around increasing landscape biodiversity.”

Dr Woodall’s plan is to mull out the results in various environments through more field testing before rolling the findings out on a commercial scale.

Dr Woodall collaborated with researchers from UWA and DAFWA and Kings Park. ↘

More information

Dr Geoff Woodall, UWA

T: 0427 449 644

E: geoff.woodall@uwa.edu.au

LEFT: Project findings reveal seeding depth recommendations could need some revision. (Photo: Kondinin Group)