



Laying bare the secrets of better lucerne mixtures

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ABOVE: Recent trials investigated the ability of lucerne to grow in a pasture mix with both temperate and tropical species.
(Photo: Suzanne Boschma)

Lucerne may benefit from isolation in a pasture mix by sowing in alternate rows according to preliminary research carried out by New South Wales Department of Primary Industries (NSW DPI) researcher Dr Suzanne Boschma at Tamworth, NSW.

Lucerne is commonly sown in northern NSW, but pastures typically have low groundcover resulting in run-off and erosion. In addition to this challenge, pure lucerne stands often cause bloat in cattle. Sowing lucerne as part of an overall pasture mixture is one way to solve both these issues.

Understanding the relative competitiveness of lucerne sown in a mixture with other species is the first step to identifying the best species to sow in mixtures with lucerne.

Investigations to date have shown that lucerne (*Medicago sativa*) is less or equally competitive as a seedling in a pasture mix with temperate pasture species, but more competitive sown during spring in mixtures with tropical pasture species – especially after harvest (or potentially grazing).

In recent trials, lucerne regrew rapidly after harvest, being more competitive than other species in a mixture, particularly during summer. Lucerne produced similar quantities of biomass whether its plant proportion in the mixture was 25 per cent or 100%. This competitiveness suggests it may benefit from isolation in a mixture by sowing in alternative rows.

Getting the right mix

Researchers carried out two experiments investigating the competitive ability of lucerne in both mixtures with temperates and tropicals.

The two replacement series experiments were carried at Tamworth Agricultural Institute, NSW. The temperate mixture experiment carried out from May to October 2007 consisted of the lucerne cultivar, Genesis, sown in a mixture with Puna chicory (*Cichorium intybus*), Eurrabie oats (*Avena sativa*), Atlas PG phalaris (*Phalaris aquatica*), Clare subterranean clover (*Trifolium subterranean*), Resolute MaxP tall fescue (*Festuca arundinacea*) and Taranna wallaby grass (*Austrodanthonia richardsonii*). A mixture of chicory and subterranean clover was also included.

The second experiment containing the tropical mixtures consisted of Genesis lucerne sown with Bambatsi panic (*Panicum coloratum* var. *makarikariense*), Floren bluegrass (*Dicanthium aristatum*), Katambora Rhodes grass (*Chloris gayana*), Premier digit (*Digitaria eriantha* ssp. *eriantha*) and Swann forest bluegrass (*Bothriochloa bladii* ssp. *glabra*) was carried out from November 2007 to January 2008.

BELOW: Dr Boschma's co-worker, Ivan Stace, transplants five-day-old seedlings into polystyrene boxes. The species were evenly distributed within each box according to their ratio and boxes were arranged in an un-balanced row-column design with three replicates. (Photo: S Boschma)

key points

- As a seedling, lucerne is more competitive in a mixture when sown during spring than autumn
- Establishment of lucerne could benefit from sowing in alternate rows within a pasture mix
- Competitiveness of species is affected by factors such as seed size, seedling vigour and plant growth habit
- After a seedling is defoliated regrowth rate and cutting height also affect competitiveness.



TABLE 1 Relative competition between lucerne and a range of temperate species at two harvests*.

Mixture (species 1-species 2)	Harvest 1	Harvest 2
Lucerne-chicory	Competition (chicory)	Over-yielding (chicory)
Lucerne-oats	Competition (oats)	Competition (oats)
Lucerne-phalaris	Equally competitive	Equally competitive
Lucerne-subterranean clover	Competition (clover)	Competition (lucerne)
Lucerne-tall fescue	Under-yielding (fescue)	Over-yielding (fescue)
Lucerne-wallaby grass	Under-yielding (lucerne)	Competition (lucerne)
Chicory-subterranean clover	Equally competitive	Competition

*The species in brackets were more competitive

In both experiments, five-day-old seedlings were transplanted into polystyrene boxes. Seedlings were sown in ratios (species 1: species 2) of 0:1, 1:3, 1:1, 3:1 and 1:0, arranged in five rows, with each row containing eight plants giving a total of 40 plants/box.

The boxes were placed in the field on wooden pallets, and watered and fertilised regularly. Holes in the bottom of the boxes allowed free drainage.

The trials were harvested twice, when the lucerne started to flower.

Temperate results

Chicory was more aggressive in a mixture than both lucerne and subterranean clover (see Table 1).

“This is possibly due to chicory plants being rosettes with large leaves potentially shading other species in the mixture,” Dr Boschma explained.

Subterranean clover was also more competitive than lucerne at the first harvest, but less so after the second harvest.

“Subterranean clover has large seeds and seedlings with a vigorous and spreading habit, potentially shading slower growing plants,” Dr Boschma explained.

“But when defoliated to 10mm it was slow to regrow as many of its growing points had been removed.”

Tall fescue was more aggressive as a seedling than lucerne, although they initially inhibited by each other resulting in under-yielding at the first harvest, while over-yielding resulted at the second harvest.

Lucerne and phalaris as seedlings in a mixture were equally competitive.

“As a mature plant, lucerne is commonly the more competitive species possibly due to its ability to dry the soil profile below the levels at which phalaris can persist,” Dr Boschma said.

In a mixture with wallaby grass, lucerne was consistently the more aggressive species. In other work, wallaby grasses was also found to be less aggressive than subterranean clover, annual ryegrass (*Lolium rigidum*) and white clover (*Trifolium repens*).

Tropical results

Rhodes grass was the only tropical grass more aggressive than lucerne, and only at the first harvest (see Table 2).

“The creeping habit of Rhodes grass enabled it to spread and root throughout the box



ABOVE: At the second harvest lucerne proved as competitive, if not more so when mixed with numerous temperate and tropical species. (Photo: S Boschma)

increasing its total proportion during the experiment,” Dr Boschma said. Previous investigations have found Katambora Rhodes grass to be more aggressive in grass mixtures than both Bambatsi panic and Premier digit.

Over-yielding at the second harvest was mainly associated with the total herbage mass of lucerne being similar (grams/box), irrespective of its proportion in the mixture.

At this harvest it was also noted that as the proportion of lucerne in the mixture decreased, the number of stems and their thickness increased.

“This may account for its high herbage mass at low plant proportions,” Dr Boschma suggested.

This work is being further investigated in the field. 🌱

More information

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TABLE 2 Relative competition between lucerne and a range of tropical grasses at two harvests*.

Mixture (species 1-species 2)	Harvest 1	Harvest 2
Lucerne-panic	Equally competitive	Over yielding (lucerne)
Lucerne-bluegrass	Equally competitive	Over yielding (lucerne)
Lucerne-Rhodes grass	Over yielding (Rhodes)	Over yielding (lucerne)
Lucerne-digit	Competition (lucerne)	Over yielding (lucerne)
Lucerne-forest bluegrass	Equally competitive	Over yielding (lucerne)

*The species in brackets were more competitive