

Locally-adapted Lotus varieties look promising



ABOVE: Breeding efforts have focussed on developing locally-adapted varieties of birdsfoot trefoil. (Photo: Leah Lane, NSW DPI)

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The FFI CRC-funded birdsfoot trefoil (*Lotus corniculatus*) breeding program has successfully developed locally-adapted varieties, which look set to provide a pioneer suite of options for grazing in high-rainfall areas. Dr John Ayres (NSW DPI) explains the potential of the promising varieties.

“In response to the limitations of existing birdsfoot trefoil varieties, such as the only commercially available cultivar Grasslands

Goldie to persist under dryland pasture conditions, the breeding program has yielded three varieties with promising potential for the high-rainfall permanent pasture zone,” explained Dr Ayres.

The varieties – Phoenix, Venture and Matador – are adapted to the short day-length of dryland pastures, especially in the northern sector of the Murray-Darling Basin. Dr Ayres believes these new varieties have the potential to significantly increase the area sown to deep-rooted pastures.

“Phoenix and Venture were bred at Glen Innes, NSW focusing on seed yield characteristics under low latitude/short day-length conditions of northern NSW,” Dr Ayres said.

“The cultivar Matador was bred at Canberra, ACT for dense and prostrate growth habit.”

The three varieties strongly contrast in vegetative appearance and growth habit, and they express high seed-yield components and favourable agronomic performance when grown under low latitude/short day-length conditions.

“Following the recent grant of plant breeders rights on all three varieties, and with release, we expect they will provide an alternative perennial legume for a diverse range of grazing applications,” Dr Ayres said.

Taking a closer look

Relative to Goldie, Phoenix is medium-leaved, fine-stemmed and high yielding in both warm-season and cool-season growth.

Venture is large-leaved, medium in stem thickness, vigorous in warm-season growth and intermediate in cool-season growth.

Matador is small-leaved, thick-stemmed (with short internodes) and has relatively lower cool-season growth, comparable to Goldie. Matador has greater leaf density than Phoenix, Venture and Goldie and is more prostrate in growth habit at the pre-flowering stage (see Table 1).

Flowering potential

Phoenix, Venture and Matador flower earlier and far more prolifically than Goldie when grown under the short day-length conditions of northern NSW (see Table 2).

Key points

- Locally-adapted birdsfoot trefoil varieties provide an alternative perennial legume option in high-rainfall grazing areas
- Improved flowering and seed production provide for greater regeneration and persistence
- The new varieties could see the significant expansion of grazing lands based on deep-rooted perennial legume-based pastures.

TABLE 1. Vegetative and growth characteristics of Phoenix, Venture and Matador birdsfoot trefoil varieties in comparison with Grasslands Goldie

	Leaf area (mm ²)	Stem thickness (mm)	Internode length (mm)	Leaf:stem ratio	Summer growth	Winter growth
Goldie	97	1.06	17.2	1.57	9.5	8.8
Phoenix	88	1.12	20.5	1.47	14.9	20.0
Venture	111	1.22	22.5	1.58	14.7	14.0
Matador	68	1.35	13.1	1.68	14.4	6.6

TABLE 2. Seed yield of Phoenix, Venture and Matador birdsfoot trefoil compared with Grasslands Goldie at two sites (Glen Innes and Inverell)

	Glen Innes			Inverell		
	Stems	Flowering stems	Umbels ¹ /stem	Stems	Flowering stems	Umbels ¹ /stem
Goldie	19.0	0.6	0.6	18.6	3.5	1.9
Phoenix	11.3	5.5	3.0	13.1	6.7	3.1
Venture	12.1	2.9	2.0	16.4	10.2	4.3
Matador	10.1	3.5	1.1	21.0	9.0	3.0

¹Cluster of pods

These attributes extend the northern limit of this valuable temperate perennial legume to at least 28°S – the NSW/Queensland border.

In addition, this species has been rated as having 'low-to-negligible' environmental weed risk.

Together with cultivars being developed for lower rainfall Mediterranean environments in southern Australia, birdsfoot trefoil offers potential to greatly expand the area of grazing lands based on deep-rooted perennials.

For a comprehensive discussion of the characteristics of birdsfoot trefoil see Focus on Perennials Issue 2. ↘

➔ **More information**

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Phoenix flowers up to seven days earlier than Goldie, while Venture and Matador flower intermediate between the two.

At both sites, Goldie produced a large number of stems, but few of these were flowering stems. Phoenix and Venture, in comparison, produced a far greater number of flowering stems. For example, at Glen Innes, (Northern Tablelands, NSW) while only three per cent of Goldie stems were flowering stems, flowering stems as a proportion of total stems for Phoenix, Venture and Matador were 49%, 24% and 35%, respectively.

At Inverell (North-West Slopes, NSW) while Goldie produced more flowering stems than at Glen Innes (19% compared with 3%), because of less cloud cover and correspondingly higher photoperiod, Phoenix, Venture and Matador produced 51%, 62% and 43% flowering stems, respectively.

“The greater the number of flowering stems, the better the ability of the variety to regenerate each year and produce new plant populations, allowing it to persist within the pasture base over the long term,” Dr Ayres explained.

Pollination tunnel trials at Glen Innes examining seed production in three consecutive years 2005, 2006 and 2007 yielded 622, 430 and 625 kilograms per hectare for Phoenix; 525, 198 and 448 kg/ha for Venture; and 102, 165 and 113 kg/ha for Matador.

Promising potential

“These varieties uniquely possess strong regeneration mechanisms for local conditions,” Dr Ayres said. “No other birdsfoot trefoil cultivar developed internationally for low latitude applications has this capability.”

Renowned legume breeder goes out to pasture

Dr John Ayres has been searching for better legume pasture options for dryland environments across Australia for more than 20 years.

This search has seen him not only become a national authority on plant improvement of perennial pasture legumes, specialising in breeding white clover (*Trifolium repens*) and birdsfoot trefoil (*Lotus corniculatus*); but has brought international recognition.

“My work has developed pasture legumes for dryland environments in the Australian Temperate Perennial Pasture Zone,” Dr Ayres explains.

“In broad terms, I have focused on increasing the persistence of pasture legumes to improve the pasture-base for sheep and cattle in temperate grazing systems and to provide enhancements to the pastoral landscape.”

After 20 years of dedicated research, John is now looking forward to putting himself out to pasture.

“I’m hanging up my lab coat, but I look forward with keen interest to following future developments, especially from the work of the FFI CRC,” Dr Ayres said. ↘

