Evaluation of Perennial Forage Legumes on Eyre Peninsula

Roy Latta and Jessica Crettenden
SARDI, Minnipa Agricultural Centre

RESEARCH

Key messages

- **The evaluation of alternative perennial legume forages has commenced at 4 sites on EP in 2010.**
- **The production and persistence of Tedera, Cullen and Sulla are being compared to Lucerne.**

Why do the trial?

The use of perennial legumes on Eyre Peninsula is largely restricted to lucerne which is not well adapted to shallow constrained soils common across much of the region. However the benefits of a perennial legume phase within an intensive cropping system for soil rehabilitation and economic weed management is well documented.

As part of a national program to identify alternative perennial legumes to lucerne suitable for incorporation within cropping systems, there are possibly at least 3 options adapted to areas within the Eyre Peninsula environment.

Research in South Australia has shown Sulla *(Hedysarum coronarium)* to be a highly productive, short lived perennial/ biennial legume. The individual plants live for 2-3 years, but it will regenerate readily from seed. It is used for grazing or hay production and contains condensed tannins that make it bloat-safe, increase protein digestion and make Sulla less attractive to insects. These tannins also provide a reputed anthelmintic effect which may reduce worm and nematode burdens. Sheep grazing Sulla have been recorded to have less dags, considered to be a result of the tannin content.

Western Australian research is suggesting that *Bituminaria bituminosa var albomarginata,* or Tedera, as it is more commonly known in its native Canary Islands, has the potential to offer a solution to lucerne's shortcomings in Australian farming systems. Lucerne may survive summer drought by its deep roots accessing a water supply and decreasing evaporation by shedding its leaves. The result of this on many EP soils is that fodder quality is lost with the dropping of the leaves and often the plant dies in the more constrained, shallow soils. Tedera is shallow-rooted and reputedly it is very drought tolerant and does not drop its leaves.

The third option *Cullen australasicum*, a native perennial legume, has been as persistent and productive as lucerne in studies to date. These results suggest that Cullen species will have adaptations to both survival and productivity traits that make them suitable for use or further development as perennial pastures in a low rainfall, Mediterranean climate.

These 3 genera briefly described above were considered worthy of evaluation to compare to lucerne at a range of Eyre Peninsula sites in 2010.

How was it done?

Six lines of forage perennials (Lucerne 1, Sulla 1, Tedera 3 and Cullen 1) were established at four Eyre Peninsula sites in 2010 to represent four rainfall and soil type regions; Minnipa (325 mm), Rudall (350 mm), Edillilie (400 mm) and Greenpatch (450 mm). Soil types varied from calcareous sandy loam to slightly acidic, shallow duplex.

The trials were hand sown in 3 x 2 m plots; Minnipa 2 June, Edillilie 22 July, Rudall 30 July, then resown on 18 September and Greenpatch 11 October. There were 4 replicates sown at Minnipa but only 2 at the other three sites due to a seed supply constraint.

What happened?

More than 400 mm of 2010 rain at Minnipa established all perennials and allowed up to 3 biomass samplings (Table 1). At Rudall insects devastated initial emergence, however a total of almost 500 mm rain allowed plots to be resown quite late in the season, resulting in low established plant densities (Table 1). The wet winter/spring conditions at Edillilie (annual total of almost 600 mm) and Greenpatch (annual total of almost 700 mm) resulted in the waterlogging of newly emerged seedlings at Edillilie and the deferment of the establishment at Greenpatch until 11 October.

Table 1 Plant establishment (plants/m^2) and total biomass (DM t/ha) at the four forage perennial sites sown in 2010

	Minnipa		Rudall	Edillilie		Greenpatch
	(plants/m^2)	(DM t/ha)	(plants/m^2)	(plants/m^2)	(DM t/ha)	(plants/m^2)
Tedera 27	17	1.3	5	9	0.6	9
Tedera 37	12	0.8	4	5	0.6	8
Tedera 42	10	1.2	4	6	0.9	7
Lucerne	10	4.1	3	8	1.0	6
Cullen	24	2.2	7	5	0.2	18
Sulla	15	4.1	4	21	3.4	17

Dry matter production was measured at 10% flowering of the individual trial entries. This resulted in Lucerne being sampled 4 times (27 October, 24 November, 18 December 2010 and 12 January 2011), Cullen was sampled 3 times, on all but the 18 December, Sulla twice (27 October and 24 November) and all 3 Tedera lines only once (24 November). Sulla and Lucerne produced highest production in the year of establishment at Minnipa, however Cullen established the most plants.

Low numbers of plants established at Rudall with late sowing date did not allow any measurable biomass production. At Edillilie increased densities of Sulla, in extended waterlogged conditions, was reflected in higher biomass production compared to other entries. At Greenpatch establishment was delayed due to waterlogged conditions and only very preliminary establishment measurements were taken in 2010.

What does it mean?

In support of previous documentation, trial indications are that Sulla will produce large amounts of biomass during the spring period in "wet" conditions, but will become dormant in the summer. Lucerne continues its productivity in conditions of adequate water availability, as has been the case in spring and early summer 2010. The Tedera has established well, albeit at relatively low numbers, and while its production and growth has been slow, compared to lucerne, the trial requires a long dry period to ascertain any benefits in persistence it may have over lucerne, especially on constrained soils. The Cullen established in reasonable numbers and being a native is seemingly adapted to a Mediterranean climate and therefore should persist over the summer/autumn period.

Both the Tedera and Cullen are only partially developed lines and as such will continue to be progressed through an intensive selection process in terms of establishment, management, persistence and animal production issues. However, these trials will give some indication as to the potential role of "improved" lines of these pasture species in the EP environment and farming systems.

Acknowledgements

Plots with Matthew Dunn at Rudall, Shane Nelligan at Edillilie and Arnd Enneking at Greenpatch.