Pastures for Mallee environments

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The aim of this study was to identify suitable pasture species for the SA Mallee

Take Home Messages

- Alkaline, calcareous, sandy soils in low rainfall (300-350mm annually) regions can support a wide range of pasture species.
- Cereals and grain legume varieties provided the highest volume of production in low rainfall years such as this year.

Background

In 2005 the Murray Mallee Local Action Group was successful in obtaining funds through the Bureau of Rural Sciences, Science & Innovation Award for young people in Agriculture, Forestry & Fisheries to evaluate the suitability of a wide range of pasture varieties in low rainfall (300-350mm) environments. The site was located 20km NE of Murray Bridge, SA. The soil types in the region are characterised as alkaline, calcareous, sandy soils. The specific site had a soil pH (CaCl) of 7.6, organic carbon was 1%, the soil depth varied from 40cm to 80cm over limestone and salinity or boron was not an issue at this site.

Method

Plot size:	12m x 600m (Shearer bar); 3m x 600m (Sod Seeder)
Summer Weed Control:	19/1/06 - 1L/ha Credit Bonus® + 1L/ha Amine 625® + 50ml/ha Garlon®
Seeder:	Shearer 5160 Bar with Berrigan Finger Harrows, Napier Blueline Airseeder hopper and Ausbox small seeds box for 12m wide plots.
	Conner Shea Sod Disc Seeder, for 2.1m wide plots, with a disc and boot seeding system.
Sowing Date:	24/5/06 – 27/5/06
Fertiliser:	Pre-seeding – 4/5/06 - High Analysis Sweepings (N 16%, P 16%, S 8%) @ 100kg/ha
	Seeding – 25th –27th May 2006 – MAP (N 11%, P 21%, S 2%) @ 90kg/ha
Post emergent herbicides:	24/8/06-29/8/06
	20g/ha Broadstrike® & 100mL/ha Verdict® on Vetches, Medics, Bisserrula, Clovers, Serradella, Lucerne
	25g/ha Broadstrike on Barley, Oats, Whet, Triticale, Ryegrass & Phalaris
	100ml/ha Verdict on Primrose & Chickory
Insect Control:	7/7/06 – 100ml/ha Dominex Duo® (active 100g/L alpha-cypermethrin

Varieties & Seeding Rates: See Table 2.

Control plots: Volunteer cereals, endemic medics, capeweed, endemic ryegrass etc.

The pasture species were sown in 600m long strips. Due to the lack of seed availability for a number of the species trialled, two different sized seeders were used to maximise the seed received. Where seed supply was low, the three metre wide sod seeder was used. Unfortunately many of these strips were still sown too light and failed to produce adequate production to be mentioned in this report. The use of the sod (disc) seeder was not ideal, however it could still be used to ascertain whether the species would be suitable to the region.

This trial is not replicated.

Results & Discussion

Rainfall & Frosts

The site received below average rainfall and this, coupled with several early frosts, especially in June, significantly effected plant growth. Table 1, shows the rainfall and frost incidence for each month. The total rainfall for the year was 247mm and this included 146mm in the growing season from April to October. By far the greatest damage was caused by the frosts in June when there were eight frosts in ten days.

Table 1: Rainfall and Frost figures for 2006

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Frosts (no of days)	0	0	0	0	3	10	0	0	0	0	0	0	13
2006 Rainfall (mm)	31	9	42	41	21	15	36	2	29	0	4	17	247
Av. Rainfall (mm)	16	18	20	29	35	37	35	37	36	34	52	22	346

Seeding & Establishment

Germination rates were highly variable and Table 2 also shows the establishment rates as at September. Germination rates may have been affected by the seeding method and the sowing conditions.

The early rains provided excellent subsoil moisture, however, the average temperature of 18.2ºC in May, coupled with wind speeds up to 59km/hr dried out the topsoil. The Shearer Bar with knife points provided sufficient mixing of the soil bringing moist soil up to the surface, but the sod seeder used cutting discs to open the soil and drop the seed into the gap with little soil disturbance. This meant that seed planted with knife-points went into wetter conditions than seed planted with the sod seeder. Lower germination rates were observed in the sod seeder plots than the airseeder plots however these were not quantifiably assessed.

Production

Production was assessed in September when cuts were taken, the results of which are shown in Table 2. The cuts for the 'perennial' varieties, such as lucerne and phalaris, were not taken as it was assumed that these would not be grazed in normal situations until late summer. Table 3

shows the feed test results for those varieties that had sufficient matter to test. The fodder sent off for sampling was sorted and all foreign plant matter removed.

Table 2: Seeding, Establishment & Production

Variety	Seeder	Seeding Rate (kg/ha)	Establishment plants/m2	Dry Matter (kg/ha)	Ranking (Dry Matter)
Vetch – Morava	Sod	68	180	1099	23
Vetch – Blanchfluer	Shearer	53	120	1866	12
Barley – Dictator Forage	Sod	81	110	2151	8
Barley – Cape/Beecher Barley	Sod	89	130	2508	5
Oats – Saia	Shearer	88	340	2430	6
Oats – Swan	Shearer	89	130	1997	11
Oats – Winteroo	Shearer	76	210	2159	7
Oats - Walleroo	Shearer	69	245	2802	2
Triticale – Ticket	Shearer	70	150	2798	3
Triticale – Speedee	Shearer	76	210	2582	4
Triticale – Rufus	Shearer	77	190	5111	1
Rudd Grazing Wheat	Sod	81	120	1403	19
Control	Shearer	-	-	2073	9
Medic – Herald	Shearer	7	95	1700	14
Medic – Santiago	Shearer	8	102	1092	24
Medic – Scimitar	Sod	8	52	1374	20
Medic - Toreador	Sod	8	92	1856	13
Medic – Angel	Sod	8	49	887	25
Medic – Cavalier	Shearer	8	91	1234	21
Medic – Caliph	Shearer	9	56	1130	22
Balansa Clover – Frontier	Shearer	13	112	791	26
Seradella – Cadiz	Shearer	36	490	1441	18
Ryegrass – Tetila Gold	Shearer	25	132	1694	15
Ryegrass – Winter Star	Shearer	25	275	1471	17
Ryegrass – Tetrone	Shearer	24	341	2063	10
Ryegrass – Guard	Shearer	24	165	1557	16
Lucerne – L55	Shearer	7	67	*	n/a
Lucerne – Q75	Shearer	6	77	*	n/a
Lucerne – Salado	Sod	8	9	*	n/a
Lucerne – L90	Shearer	6	57	*	n/a
Lucerne – Hunterfield	Shearer	7	76	*	n/a
Chickory – Puna	Sod	8	27	*	n/a
Primrose	Sod	9	10	*	n/a
Veldt Grass	Sod	7	12	*	n/a
Phalaris – Sirosa	Shearer	8	140	*	n/a

Note: * Dry matter cuts were not taken on perennial species as grazing would not occur in the establishment year (first year).

Table 3: Fodder values for pasture species

Variety	Crude protein (N x 6.25)	Digestibility (DOMD)	Metabolisable Energy (MJ/kg DM)	Digestibility (DMD)	Neutral Detergent Fibre	Dry Matter (%)	Water Soluble Carbohydrate
Vetch – Morava	26.6	69.7	11.2	74	35.4	26.1	3
Vetch – Blanchfluer	25.8	71.3	11.5	76	37.5	22.9	4
Barley – Dictator Forage	14.0	71.2	11.5	76	46.3	27.9	23
Barley – Cape/Beecher Barley	14.1	70.0	11.2	75	49.9	25.3	19
Oats – Saia	14.1	73.4	11.9	79	43.5	31.5	23
Oats – Swan	10.0	70.2	11.3	75	46.4	29.6	28
Oats – Winteroo	8.1	68.6	10.9	73	47.8	29.0	29
Oats - Walleroo	13.2	68.7	10.9	73	48.0	32.2	19
Triticale – Ticket	12.3	62.3	9.6	65	57.3	31.5	15
Triticale – Speedee	9.4	60.9	9.4	64	58.0	39.2	19
Triticale – Rufus	10.3	61.5	9.5	65	55.4	42.2	21
Rudd Grazing Wheat	14.7	71.8	11.6	77	48.6	32.0	22
Control	15.7	70.5	11.3	75	38.2	16.4	8
Medic – Herald	19.2	61.8	9.5	65	40.0	32.0	7
Medic – Santiago	19.0	62.2	9.6	65	40.5	36.2	7
Medic – Scimitar	20.4	60.6	9.3	63	40.6	34.9	6
Medic - Toreador	19.8	60.2	9.2	63	42.6	35.5	5
Medic – Angel	23.1	63.2	9.8	67	38.1	30.7	5
Medic – Cavalier	15.3	65.7	10.3	70	36.3	26.4	11
Medic – Caliph	17.2	64.4	10.1	68	39.0	30.5	9
Biserrula – Casbah	22.5	66.6	10.5	71	33.9	26.2	3
Balansa Clover – Frontier	20.4	68.0	10.8	72	33.5	25.2	11
Seradella – Mauro	14.8	62.0	9.6	65	44.5	25.3	2
Seradella – Cadiz	22.6	70.4	11.3	75	34.4	25.1	3
SARDI Rose Clover	19.1	63.5	9.9	67	41.9	28.2	5
Ryegrass – Tetila Gold	16.0	80.1	13.3	86	38.0	25.7	29
Ryegrass – Winter Star	16.4	79.3	13.1	86	40.8	24.3	24
Ryegrass – Tetrone	12.8	80.1	13.3	87	38.9	28.0	34
Ryegrass – Guard	11.4	76.0	12.4	82	40.2	30.5	33
Clover – Enduro	21.4	71.1	11.4	76	30.8	25.1	11
Turnip – Giant Purple Top	21.4	80.9	13.4	87	25.2	16.2	13
Fodder Rape – Rangi	22.8	78.9	13.0	85	25.6	16.6	10
Lucerne – L55	29.5	70.3	11.3	75	29.9	24.2	2
Lucerne – Q75	30.3	70.4	11.3	75	28.8	23.7	2
Lucerne – L90	29.8	70.4	11.3	75	28.6	21.7	2
Lucerne – Hunterfield	29.4	69.9	11.2	75	29.7	26.5	2
Chickory – Puna	28.4	76.4	12.5	82	29.9	14.1	3
Phalaris – Sirosa	18.8	74.7	12.2	80	45.7	24.1	14

Interpretation

Establishment

The highest plant establishment occurred with Cadiz Serradella with 490plants/m^2. Serradella's are grown successfully in Western Australia on deep sandy soils with pH between 3 and 8. The soil pH at the trial site was at the higher end of this variety's preference. In addition, this variety was planted without the appropriate innoculant. The seeding rate of 30kg/ha is considered to be high, but not extreme. This performance was unexpected and warrants greater investigation into this varieties performance in more favorable rainfall conditions.

Good establishment rates were recorded for the Ryegrass varieties Tetrone, Winterstar, Guard and Tetila Gold (Table 2). Their establishment rates should serve to remind producers that ryegrass is a valuable tool in pasture systems in the Mallee.

Cereals, in general, established well however, Saia Oats provided an almost 'lawnlike' style of pasture base, reducing the risk of soil erosion through higher rates of grazing. Many would regard the plant densities in the vetch plots to be satisfactory for cropping purposes, however, overgrazing these stands would expose light soils to wind erosion and would need to be carefully managed.

Lucerne varieties, L55, Q75, L90 & Hunterfield. were well established at the end of the season (December) and appear to have a higher than 90% survival rate through the first summer. It should be noted that the Lucerne planted in the trial was seeded using twice the normal rate of innoculant. A study being undertaken by Suzanne McKay (SARDI) is investigating the effect of doubling the rate of innoculum. At this stage, indications suggest that the double innoculant rate produced a significantly higher level of establishment. Nodulation rates at the trial site were significantly higher than other sites being monitored and there is some suggestion that higher rates of innoculant outcompete unfavourable pathogens such as Pythium and Rhizoctonia, especially AG8 strain which can affect the root development of juvenile lucerne plants.

Sirosa Phalaris officially requires 350+mm annual rainfall. The establishment rate of 140plants/m^2 observed in this trial exceeds acceptable establishment rates. This species will be monitored over summer to determine persistence. Should more than 60% of plants survive this summer then this variety should undergo further investigations.

Dry Matter Production

The cereals, vetches and ryegrasses provided the bulk of production this year. It should be noted that the three Triticales were ranked in the top four dry matter production systems.

Of the oat varieties Walleroo, Saia and Winteroo with 2802kg/ha, 2430kg/ha & 2159kg/ha of dry matter respectively all offer significant opportunities for fodder production.

Note: Herald Medic, produced 1700kg/ha of dry matter, exceeding the average medic production by 148%. Angel Medic – the SU (Glean) tolerant variety failed to produce similar biomass production (67% of average medic production). Angel Medic should only be sown where SU residues are an issue. The last SU applied to the trial site was Ally at 5g/ha in 2002.

Fodder Quality

Metabolisable Energy (ME) is the most important component of any feed ration. Animals require a minimum of 8MJ/kg to survive. ME levels in all varieties exceeded the minimum level. Digestibility determines the amount of nutrients that are available to the animal and

varies depending on the freshness of the plant. The levels observed in the varieties were all satisfactory.

Protein is important in 'finishing' systems and when feeding young developing animals. Young animals need a minimum of 15% Crude Protein to grow and develop. There were a number of varieties, particularly the oats and triticales, in the trial that failed to produce sufficient protein levels during September. All protein levels were sufficient to sustain mature animals however growers wishing to grow stock out on the lower protein varieties need to either supplement with lupins (or other high protein feed sources) or plant pasture blends utilizing high protein yielding pasture varieties.

Production Potential

The 'Grazing Potential', applies the 'Fodder Ration Methodology' to each variety to evaluate their performance. Table 5 below includes all varieties from the trial that have the best potential in the Mallee environment. From these results we can clearly see that an annual system using Rufus Triticale provided the best fodder production system for the Mallee environment in the trial this year. Allowing for a residual of 1500 kg/ha for environmental management, digestibility of 61.5% and 30% wastage this would have provided 370 DSE grazing days/ha for a standard dry adult merino.

Table 4: Grazing Potential

Variety	Average Dry Matter (kg/ha)	Available (kg/ha)	Digestible Dry Matter (kg/ha)	DSE (days)
Triticale – Rufus	5111	3611	2221	370
Triticale – Speedee	3582	2082	1268	211
Oats – Walleroo	2802	1302	894	149
Triticale – Ticket	2798	1298	809	135
Barley – Cape/Beecher Barley	2508	1008	706	118
Oats – Saia	2430	930	683	114
Barley – Dictator Forage	2151	651	464	77
Oats – Winteroo	2159	659	452	75
Ryegrass – Tetrone	2063	563	451	75
Control	2073	573	404	67
Oats – Swan	1997	497	349	58
Vetch – Blanchfluer	1866	366	261	43
Medic - Toreador	1856	356	214	36
Ryegrass – Tetila Gold	1694	194	155	26
Medic – Herald	1700	200	124	21
Ryegrass – Guard	1557	57	43	7

Note: DSE days are based on the daily herbage requirements of an adult sheep (4.5kg/hd/day) plus 30% for wastage

Commercial Practice

From this trial, the cereal crops produced the greatest production of feed. The fodder values reported in this trial were taken in September. Cereal crops are usually sown early (April-May) and grazed during the mid-tillering stage (6-8 weeks after emergence). The fodder values during this period would be expected to be higher than the values reported in this article.

For the Mallee, oats and triticale were the best annual pasture options when targeting a feed gap in mid-winter-early spring, in terms of production. These crops are a break crop (useful especially for reducing the risk of cereal root diseases) and are relatively cheap. If the paddock has had a good history of phosphorus applications, fertilisers can be avoided or a least rates can be reduced if growing cereals for hay or grazing, unless medics are sown in combination.

For longer pasture phases, the lucerne varieties performed well in the Mallee an although the production data has not been reported in this article, these varieties can produce ample quality feed during the summer and autumn period.