# EMERGING FORAGE LEGUME VARIETIES

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## TAKE HOME MESSAGES

- In 2013, newer varieties of medic (Sultan-SU), vetch (RM1 and Timok) and forage pea (PBA Hayman) when cut at the same time (different stages between maturities) performed better or equally as well in forage value as previously used varieties.
- Choose forage legume varieties to suit your paddock system needs. Consider group B (herbicide tolerance, disease and aphid resistance, the type of seed (soft or hard) and growing season length of newer varieties to suit grazing, hay and/or seed production.

## KEY WORDS

Feed value, forage legumes, pasture, system benefits.

## BACKGROUND

For a legume to be of most benefit to a farming system, it needs to be well nodulated and have high grain yields or grain of high value, or have significant dry matter production. Dry matter (DM) production is valuable to livestock as high quality feed and/or hay, and is indicative of below ground root activity which provides both soil nitrogen fixation and a disease break for subsequent cereal and oilseed crops.

Annual medic used to be common in Mallee mixed farming systems, but in the past 15 years has significantly declined through intensified cropping, sulfonylurea (SU) herbicide residues preventing medic persistence in pasture phases, and drought preventing seedset. Instead, vetch is now often sown to supply pasture feed and hay.

Newly released varieties and emerging breeding lines of medic, vetch and forage peas have been selected for a number of improved traits including earlier maturity; higher grain and/or dry matter production; softer seed; aphid and powdery mildew resistance and SU tolerance (i.e. to SU soil residues). These traits could offer growers new pasture options with benefits for both their livestock and cropping enterprises.

## AIM

To evaluate emerging and newly released medic, vetch and forage pea varieties for their ability to produce dry matter and nutritive value for stock in the Mallee and Wimmera environments.

# METHOD

Trials were sown at Hopetoun and Nhill to represent Mallee and Wimmera soils respectively (Table 1).

**Table 1. Soil characteristics at the Hopetoun and Nhill sites.**

| Site | Hopetoun | Nhill |
|---|---|---|
| Soil description | Red sand over clay | Grey cracking clay |
| Soil pH(water) | 8.7 | 8.8 |
| Phosphorus (Colwell P) | 20 | 12 |
| Buffer Index (PBI-Col) | 46 | 170 |
| Rainfall | ave GSR: 195mm<br>2013 GSR: 204mm | ave GSR: 213mm<br>2013 GSR: 339mm |

| | | |
|---|---|---|
| Replicates: | Four | |
| Sowing date: | Hopetoun | 24 April 2013 |
| | Nhill | 23 April 2013 |
| Target plant density: | Vetch | 60 plants/$m^2$ |
| | Forage peas | 35 plants/$m^2$ |
| | Medic | 10 kg/ha |
| Varieties: | Outlined in Table 1 | |
| Inputs/fertiliser: | Granulock Supreme Z (55 kg/ha) + Impact (200 mL/ha) | |
| Seeding equipment: | BCG parallelogram cone seeder (knife points, press wheels, 30 cm row spacing) | |
| Dry matter cuts: | Hopetoun: medic and peas: 17 September, vetch: 2 October | |
| | Nhill: medic: 10 October, peas and vetch: 18 October | |

Details of the pasture varieties and agronomic traits of interest are outlined in Table 2.

**Table 2. Agronomic traits of forage legume in trials at Hopetoun and Nhill, 2013.**

| Forage type | Variety | Year of release | Maturity, ~ days to flower | Rec. rainfall (mm) | Seed hardness |
|---|---|---|---|---|---|
| Strand medics | Herald | 1996 | Early/mid, ~ 85 | 275-400 | ~ 75-85% |
| | | **Beneficial trait/s:** strand medic; aphid resistant replacement for Harbinger; suited to lighter/sandy soils. | | | |
| | Angel | 2007 | Early/mid, ~ 85 | 275-400 | ~ 75-85% |
| | | **Beneficial trait/s:** as for Herald; plus tolerance to sulfonylurea (SU) herbicide residues and Clearfield™ residues. | | | |
| | SAGIT 1 | TBC | Early/mid, ~ 85 | 275-400? | ~ 75-85% |
| | | **Beneficial trait/s:** as for Angel; SU tolerance plus resistance to powdery mildew; experimental, targeted for sandy soils. | | | |
| | SAGIT 2 | TBC | Early/mid, ~ 85 | 275-400? | ~ 75-85% |
| | | **Beneficial trait/s:** as for Angel; SU tolerance plus resistance to powdery mildew; experimental, targeted for sandy soils. | | | |

| Forage type | Variety | Year of release | Maturity, ~ days to flower | Rec. rainfall (mm) | Seed hardness |
|---|---|---|---|---|---|
| Barrel medics | Caliph | 1993 | early/mid, ~ 85 | 275-375 | ~ 90-95% |
| | | **Beneficial trait/s:** barrel medic; aphid resistant replacement for Cyprus; suited to heavier soils; can be very hardseeded. | | | |
| | Sultan-SU | 2014 | early/mid, ~ 85 | 275-400 | ~ 80-85% |
| | | **Beneficial trait/s:** as for Caliph; plus tolerance to SU herbicide residues; softer seeded/greater regeneration, boron tolerant | | | |
| | APA 2 | NA | early/mid, ~ 90 | TBC | TBC |
| | | **Beneficial trait/s:** as for Sultan-SU; experimental line. | | | |
| | Jester | 2002 | mid, ~ 110 | 350-500 | ~ 75-85% |
| | | **Beneficial trait/s:** aphid resistant replacement for Jemalong; suited to heavier soil types. | | | |
| | APA 3 | 2016? TBC | mid, ~ 110 | 350-500 | ~ 75-85% |
| | | **Beneficial trait/s:** as for Jester; plus tolerance to SU herbicide residues. | | | |
| | Mogul | 1992 | mid, ~ 110 | 350-500 | ~ 70-80% |
| | | **Beneficial trait/s:** aphid resistant replacement for Borung; good regeneration. | | | |
| Burr medic | Cavalier | 2004 | mid, ~ 110 | >375 | ~ 70-80% |
| | | **Beneficial trait/s:** burr medic; softer seeded than Santiago, greater regeneration; moderate salinity and waterlogging tolerance. | | | |
| Vetch | Morava | 1998 | late | 400 | 0% |
| | | **Beneficial trait/s:** very high in dry matter production in rainfall areas >400. Rust resistant. | | | |
| | Rasina | 2006 | early-mid | <380 | 2% |
| | | **Beneficial trait/s:** earlier than Morava, higher grain yield in low-mid rainfall areas. Rust resistant. | | | |
| | Blanch Fleur | N/A | early-mid | <380 | 15% |
| | | **Beneficial trait/s:** rust susceptible, good grain producer in absence of rust. | | | |
| | Timok | 2013 | late-mid, ~ 100-105 | >380 | 0% |
| | | **Beneficial trait/s:** in low-mid rainfall areas better dry matter production than Morava. Earlier in flowering by 7-10 days than Morava. Rust resistant. | | | |
| | Volga | 2013 | early, ~ 90-100 | <380 | 3% |
| | | **Beneficial trait/s:** earlier maturing and superior grain production than all present vetch varieties in low, mid and high rainfall areas. Rust resistant. | | | |
| | 35149 | - | late | >450 | - |
| | | **Beneficial trait/s:** still under selection. | | | |
| | RM 4 | 2013 | early | >380 | 5-7% |
| | | **Beneficial trait/s:** compare with Capello; earlier for 7-10 days, and higher in dry matter production for 5-10%. | | | |
| | RM 1 | - | mid | >400 | - |
| | | **Beneficial trait/s:** still under selection. | | | |
| Forage peas | Morgan | 1998 | late | | |
| | | **Beneficial trait/s:** PM (M) | | | |
| | PBA Hayman | 2013 | late | | Soft |
| | | **Beneficial trait/s:** PM (R), small seed (reduced sowing costs), long season. | | | |

PM – Powdery Mildew

# RESULTS AND INTERPRETATION

## *Medic*

Medic cultivars and entries were selected to suit the soil types and environments in which they were trialled.

The soil type at Hopetoun was sand over clay; most of the entries were strand medics, including two advanced experimental lines which are a result of crossing Angel strand medic with a line identified with powdery mildew resistance. Selected as having improved dry matter and seed yield through a South Australian Grains Industry Trust (SAGIT) project, these new lines have tolerance to SU herbicide residues, aphid resistance, powdery mildew resistance and a larger seed size.

The single barrel medic line also included at this site is a new variety about to be released in 2014 as "Sultan-SU" by Heritage Seeds Limited. This has been bred from Angel and Caliph and as well as tolerance to SU herbicide residues, it has also been selected for lower hard seededness, resulting in greater regeneration in the year after establishment.

Most of the entries performed well (Table 3) with respect to dry matter production, with the average yield in excess of 4.2t/ha. This is equivalent to about 120kg/ha of atmospheric nitrogen being fixed into the total organic nitrogen pool, and available for mineralisation and utilisation by following crops in subsequent years. One slightly unexpected result on this soil type was the good performance of Sultan-SU. Although Sultan-SU has been mostly tested and targeted for use on heavier soil types, this result may indicate a broader adaptation.

The site at Nhill was on a heavier textured soil and although there was no significant difference between the entries, they all yielded very well, with an average site yield of 5.2t/ha, equating to about 150kg/ha of fixed atmospheric nitrogen. It was pleasing again to see the excellent performance of the new variety, Sultan-SU, this time on a site closer to its original target environment.

**Table 3. Dry matter performance of medic cultivars at Hopetoun and Nhill in 2013.**

| Hopetoun (17 September) | | Nhill (10 October) | |
|---|---|---|---|
| **Variety** | **DM (t/ha)** | **Variety** | **DM (t/ha)** |
| Sultan-SU | 4.85 | Sultan-SU | 5.88 |
| Herald | 4.44 | Caliph | 5.74 |
| Angel | 4.23 | Cavalier | 5.54 |
| SAGIT 2 | 4.33 | Mogul | 5.06 |
| SAGIT 1 | 3.14 | Jester | 4.94 |
| | | APA 2 | 4.78 |
| | | APA 3 | 4.72 |
| Sig. diff. | NS | Sig. diff. | NS |
| LSD (P=0.05) | - | LSD (P=0.05) | - |
| CV% | 17.7 | CV% | 18.8 |

## *Vetch*

The same set of vetch varieties was sown at both sites.

In SARDI trials in rainfall areas >380mm, longer growing season woolly pod vetches out-yielded common vetches. At sites in mid-low rainfall areas, the common vetches out-yielded the woolly, because they are earlier and in many areas 'escape' the drought of the season. It is likely that because the woolly pod and common vetches were planted and cut at the same time that they were at different growth stages; the common vetch was already beginning to pod, while the woolly was still flowering.

Hopetoun was planted 24 April and cut 2 October; Nhill was planted 23 April and cut 18 October. This cut timing was perfect for the woolly pod lines at both sites, but approximately 3-4 weeks late for the common vetch.

*Woolly pod vetch lines*

**RM1:** performed well at both sites under the average to above average growing season in conditions of 2013. With good rainfall, this line yields well and produces good quality fodder.

**RM4:** yields were disappointing at both sites. Over the last five years in South Australian trials, in areas between 380mm to 450mm rainfall, it has out yielded all other lines.

**35149:** the latest of the woolly pod lines; yield was down on expectations.

*Common Vetch Lines*

**Morava:** Yielded well at both sites. It is the latest of the common vetch lines and would have benefited most from the long season; it would have been podding at cutting so yields were slightly inflated.

**Timok:** an excellent hay producer, it did very well at both sites, matching or beating Morava. These yields again were slightly above expectation because it would have had full pods when cut.

**Rasina:** Predominantly targeted at grain production, but produces good quality hay. It is not expected to yield as well as Morava. However this early to mid maturing line would have had full pods when cut which inflated the yields of dry matter.

**Volga:** The earliest maturing line, aimed into low-medium rainfall areas (<380mm). This line would not have benefited from the late rain and long growing season, as it flowers in 90-100 days. The longer season varieties would have kept growing and accumulating biomass, Volga would have had full pods at cutting.

**Blanchefleur:** Yielded well at both sites, a mid-season variety with good potential; care should be taken with this variety as it is rust susceptible. If rust occurs, yields will fall drastically and care must be taken not to feed infected hay to pregnant livestock.

**Table 4. Performance of vetch cultivars at Hopetoun and Nhill in 2013.**

| Variety | Dry matter (t/ha) | |
|---|---|---|
| | Hopetoun (2 October) | Nhill (18 October) |
| RM 1 | 7.02[a] | 5.33[a] |
| Timok | 7.45[a] | 5.01[abc] |
| Morava | 7.00[ab] | 5.13[ab] |
| Rasina | 7.00[ab] | 4.97[abc] |
| Volga | 6.82[ab] | 3.88[c] |
| Blanchfleur | 5.96[abc] | 5.30[a] |
| 35149 | 5.44[bc] | 3.9b[c] |
| RM 4 | 4.89[c] | 3.82[c] |
| Sig. diff. | P=0.04 | P=0.048 |
| LSD (P=0.05) | 1.57 | 1.25 |
| CV% | 13.5 | 18.1 |

## *Forage peas*

The dry matter of PBA Hayman was similar to Morgan in 2013 at Hopetoun and Nhill (Table 5). What should be noted with this trial was that all cuts were taken on the same day. PBA Hayman is at least two weeks later maturing than Morgan and as such tends to produce more dry matter in the last weeks before flat pod. Another benefit of cutting hay later in the season is avoiding any late Spring rain. There was a report of a PBA Hayman hay cut of 4t/ha at Wooroonook with feed tests being identical to that of vetch grown in the same area. Reported grain yields of 2t/ha at Jeparit and Inverleigh may look disappointing, but PBA Hayman is not a dedicated grain variety and ultimately yields of 30-50% of other field pea lines should be expected.

Early sowing of field peas may allow for extra dry matter production, but there is a trade-off between this and disease management. Earlier sown field peas may encounter harsher disease pressure and a full fungicide program should include a mancozeb or chlorothalonil prior to canopy closure and early flowering to control Black spot. In areas in which downey mildew may be present, an application of tebuconazole may be necessary mid-flowering. This program is also recommended for later sown field peas; disease pressure will ultimately be lower.

**Table 5. Dry matter performance of forage pea cultivars at Hopetoun and Nhill in 2013.**

| Variety | Dry matter (t/ha) | |
|---|---|---|
| | Hopetoun (17 September) | Nhill (18 October) |
| Morgan | 3.02 | 4.34 |
| PBA Hayman | 3.13 | 3.86 |
| Sig. diff. | NS | NS |
| LSD (P=0.05) | - | 0.53 |
| CV% | 25.9 | 5.7 |

# COMMERCIAL PRACTICE

The best dry matter performers of the medic, vetch and forage pea varieties offer the greatest grazing value to the livestock enterprise. They would also contribute the highest soil nitrogen fixation for the following cropping phase, with each tonne of shoot dry matter produced reflecting approximately 25kg N/ha fixed in the soil.

Forage legumes not only offer grazing value to the system but also other system benefits that are harder to put a value on. group B herbicide tolerance enables medic to be grown where group B herbicide soil residues would otherwise inhibit growth of intolerant medic varieties. Having soft seed enables better germination of spilled seed the following year, generating early forage value or better control in a grain crop. Disease and pest tolerance facilitates production and reduces input costs. Longer growing season length is beneficial for forage production as pastures will remain vegetative for longer, hay can be cut later and the pasture can utilise late rains in the season. However if needing seed set, choose an earlier maturing variety for low rainfall environments.

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