Agriculture
WESTERN AUSTRALIA

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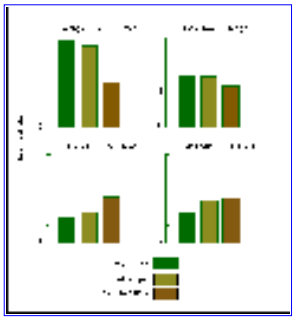

Figure 1. Yields of yellow lupin and narrow-leafed lupin at several sites in Western Australia with different soil aluminium levels.

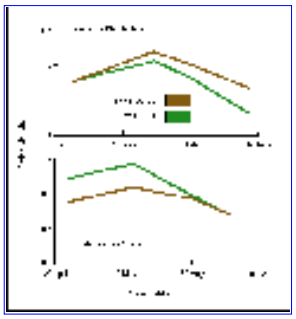

Figure 2. The response of Teo yellow lupin and Myallie narrow-leafed lupin to sowing time at two sites in Western Australia with different soil aluminium (Al) levels.

Farmnote

Growing yellow lupins in Western Australia

By Bob French, Grain Legume Agronomist, Merredin

Yellow lupin, a new crop species for Western Australia's wheatbelt, has greater tolerance than narrow-leafed lupin to soil acidity, brown leaf spot, *Pleiochaeta* root rot and Eradu patch. It also has greater tolerance to waterlogging and manganese deficiency than narrow-leafed lupins. The first yellow lupin cultivar suitable for Western Australian wheatbelt conditions, Wodjil, was released by Agriculture Western Australia in 1997 and became available to commercial growers at the end of 1998. Wodjil yellow lupin is immune to cucumber mosaic virus, and CMV seed testing is not necessary, but it is more susceptible to anthracnose than narrow-leafed lupin.

Adaptation

Yellow lupin outyields narrow-leafed lupin on acid soils when levels of extractable aluminium or disease levels are high. We therefore expect yellow lupin to be most successful on the wodjil soils of the eastern and north-eastern wheatbelt, since these soils are very acidic and often have high levels of aluminium. Further research is required to identify other regions of adaptation, such as the grey sandy soils of the south coast where yellow lupin sometimes performs well. However, Wodjil is not as responsive to seasonal conditions as narrow-leafed lupin, so it may not yield as well in very good seasons or on more fertile soils (Figure 1).

Wodjil flowers about five to seven days later than current cultivars of narrow-leafed lupin but normally matures before narrow-leafed lupin. This is an advantage in low rainfall areas.

Yellow lupin therefore has the potential to improve lupin productivity and consequently cereal productivity, on a large area of currently poor cropping soils. It also has the potential to allow more intensive cropping rotations on other soils where the frequency with which lupin can be grown is limited by disease build-up. It is feasible that a 1:1 lupin-wheat rotation could be grown with the lupin phase alternating between narrow-leafed and yellow lupin.

Yellow lupin should provide greater rotational benefits than narrow-leafed lupin on soils where it is adapted. At the same grain yield, yellow lupin fixes more N than narrow-leafed lupin because it produces more biomass with a greater N content. It also leaves more residual N because both species export about the same proportion of total N in the seed. However, rotational benefits will not be as great in situations where narrow-leafed lupin grows and yields better.

Agronomy package

The agronomy package for yellow lupin is similar to that for narrow-leafed lupin, but has some crucial differences, which are outlined below.

Paddock selection

On soils where narrow-leafed lupin grows well, the yield potential of yellow lupin is less than narrow-leafed lupin, but Wodjil can outyield narrow-leafed lupins on acidic soils with high levels of extractable aluminium or high levels of brown leaf spot or Eradu patch disease. Toxic levels of aluminium will not, in general, occur unless the pH (in $CaCl_2$) is less than 4.5.

Yellow lupin may also be a better choice than narrow-leafed lupin on soils with lower levels of extractable aluminium if high levels of brown leaf spot, *Pleiochaeta* root rot or Eradu patch are expected, for example, in tight rotations with cereals. Paddocks with low broadleaf weed burdens should also be chosen for yellow lupin because it is not as tolerant of broadleaf herbicides as narrow-leafed lupin.

Table 1. Paddock choice for yellow lupin

Situations to which yellow lupin is suited	**Wodjil soils** pH below 4.5, Al/EC ratio greater than 0.9, history of poor narrow-leafed lupin yields **High disease levels** On acid soils with lower Al levels in close (1:1 lupin:wheat) rotations where there is a history of bad brown leaf spot in narrow-leafed lupin, eg in some parts of the eastern wheatbelt. **Other situations** On some acid soils in high rainfall areas, and where waterlogging is common, yellow lupin can do well, but we cannot yet identify these situations with any certainty.
Situations to which yellow lupin is not suited	Fertile soils with pH greater than 4.5, especially if disease levels are low. High risk anthracnose areas.

Sow early

Yellow lupin should be sown early (late April to early May) for best results, although there are indications that it is not as sensitive to delayed sowing as narrow-leafed lupin (Figure 2). This may be due to the rapid maturity of yellow lupin and its tolerance of manganese deficiency.

For that reason, and because yellow lupin will mostly be grown on the poorer soils on the farm, the most practical option is to sow yellow lupin after narrow-leafed lupin.

Avoid sowing into a rapidly drying seedbed before the end of April. Sowing into dry soil is acceptable, but it may lead to weed control difficulties.

Use good quality seed

Yellow lupin seed should be tested for germination and anthracnose. Seed should not be used if anthracnose is detected. Seed rate should be raised if germination is below 80 per cent. All yellow lupin seed should be treated with fungicide (thiram or carbendazim) for anthracnose irrespective of the result of the anthracnose test.

Where lupin has not been grown within the past five years, inoculate the seed with group G inoculum. To avoid antagonistic effects of the fungicide seed dressing, apply inoculum at double the recommended rate within a day of seeding. Inoculation is not necessary where there is a recent history of lupin growing. However, on old lupin land seed should be treated with Rovral®, Civit® or Sumisclex® to control brown leaf spot.

Sow shallow

Sow 90 kg/ha 80 per cent germinable seed 3 to 4 cm deep. Retain cereal stubble where possible to reduce brown leaf spot spread by rain splash. Yellow lupin can be sown on wider than 18 cm rows to facilitate trash clearance.

There is no evidence that the optimum plant density for yellow lupin differs from that for narrow-leafed lupin. For the yields expected on the target soils (up to 1.5 t/ha) the establishment should be at least 45 plants per square metre. A sowing rate of 90 kg/ha is recommended if the germination percentage is 80 per cent. It is important to have the seed germination tested and to raise the seed rate if necessary.

It is crucial not to sow too deep. In trials, sowing deeper than 5 cm often results in very poor emergence. Do not sow deep in an attempt to find moisture as it is better to wait for rain before sowing yellow lupin.

Fertiliser

Yellow lupin is not as responsive to phosphate (P) as narrow-leafed lupin. It has varied from being completely unresponsive to about half as responsive as narrow-leafed lupin in trials in the wheatbelt. Since yellow lupin will be grown largely on relatively infertile soils, an economic response to more than 9 kg/ha P is unlikely. Where there is a good super history much less P will be necessary, perhaps even none. Most soils on which yellow lupin will be grown fix P strongly, so P should either be drilled with the seed or banded below the seed, but not topdressed.

Potassium should be applied as for narrow-leafed lupin. Yellow lupin appears to have a lower manganese requirement than narrow-leafed lupin.

Weed control

Simazine is the main herbicide for use on yellow lupin, but it is not as safe as on narrow-leafed lupin. Most wodjil soils have a reasonable clay content so up to 2.5 L/ha simazine can be safely used, but do not use more than 2.0 L/ha on sandier soils such as Eradu sand plain. Do not use more than 500 mL/ha atrazine and do not use simazine top-up.

Post-emergent grass herbicides can be safely used on yellow lupin. Brodal® is the safest post-emergent broadleaf herbicide on yellow lupin, but more leaf

bleaching will occur than with narrow-leafed lupin. Metribuzin/Brodal® mixtures can be used at low rates (do not exceed 60 g/ha metribuzin + 60 mL/ha Brodal®) but expect to see some leaf burn after application. Do not use Eclipse® on yellow lupin.

Crop topping yellow lupin may be a useful integrated weed management strategy given its rapid maturity; however, this has yet to be investigated.

Insect control

Wodjil yellow lupin is more susceptible to red-legged earth mite (RLEM) and aphids than most narrow-leafed lupin cultivars. Monitor the crop carefully following emergence for RLEM and spray if necessary.

Feeding damage by aphids can severely reduce yellow lupin yields and, in some cases, kill crops. The crop is most susceptible to aphid feeding damage during budding and flowering. Begin regular monitoring for aphids when buds start to appear in your crop. If 30 per cent or more of growing tips are obviously infested with aphids, spraying is warranted. Do not delay spraying if this threshold is reached. More than one spray may be necessary in some seasons.

Manage native budworm in yellow lupin as you would in narrow-leafed lupin.

Check with your local Agriculture Western Australia office or farm supplier for a list of currently registered chemicals for each insect pest.

Harvesting

Yellow lupin is generally ready to harvest before narrow-leafed lupin. Do not delay harvesting as shattering losses can occur if the pods get too dry. Yellow lupin can also be difficult to thresh. If the grain is to be used as seed, harvest gently at optimum moisture content to maximise seed viability.

Utilisation

Yellow lupin grain has higher protein (37 to 40 per cent) than narrow-leafed lupin (31 to 34 per cent) and higher contents of some essential amino acids. This means that it has superior feed quality for pigs, poultry and ruminants. Further research is necessary to define the extent of this superiority.

Further reading

- Farmnote No. 24/97 'Lupin anthracnose' (Agdex 161/633).
- Farmnote No. 44/99 'Aphids in lupin crops: their biology and control' (Agdex 161/622).
- 'Cereal, Pulse and Oilseed Weed Spraying Charts' (Agdex 102/64) Annual publication of Agriculture Western Australia.

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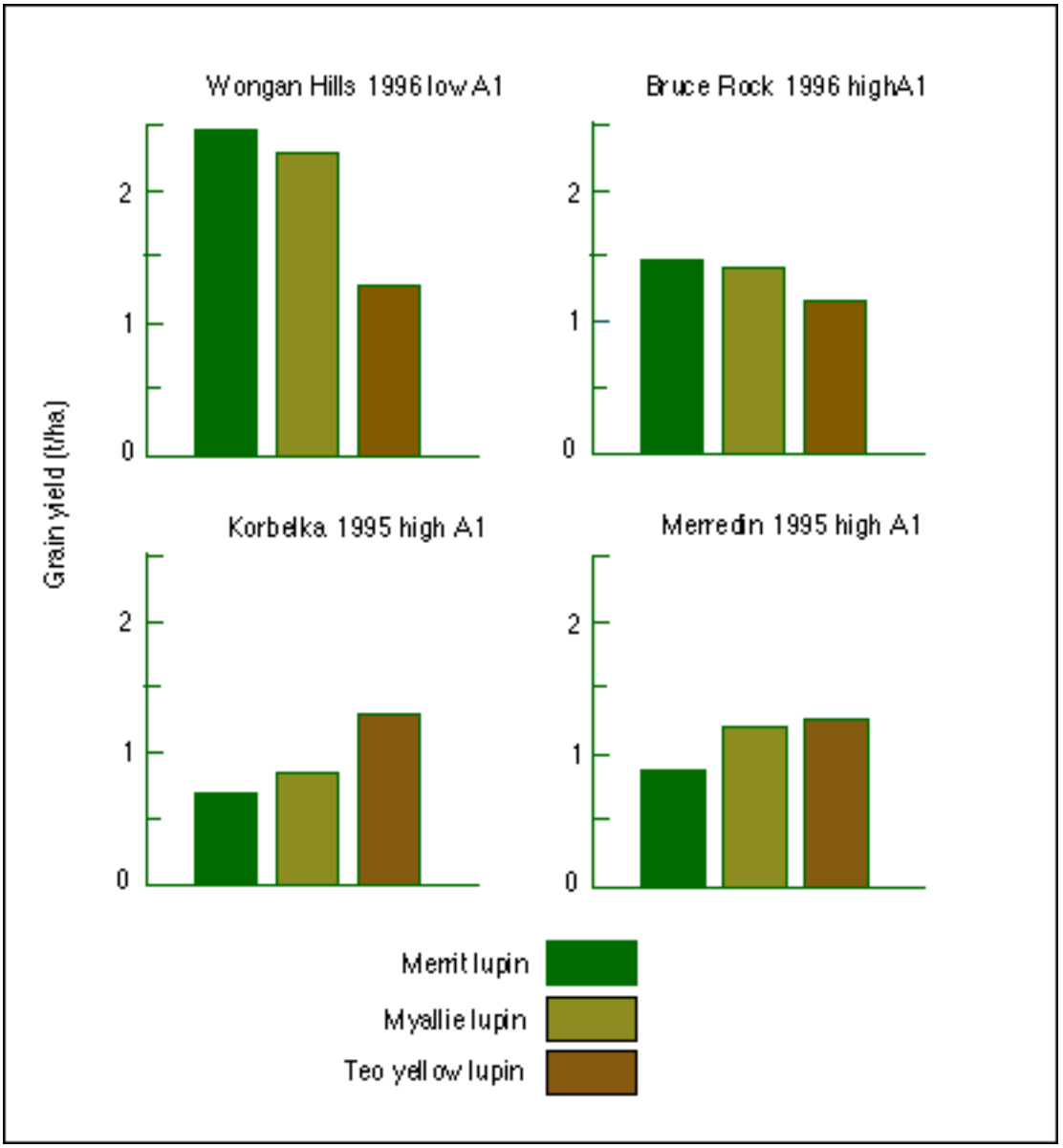

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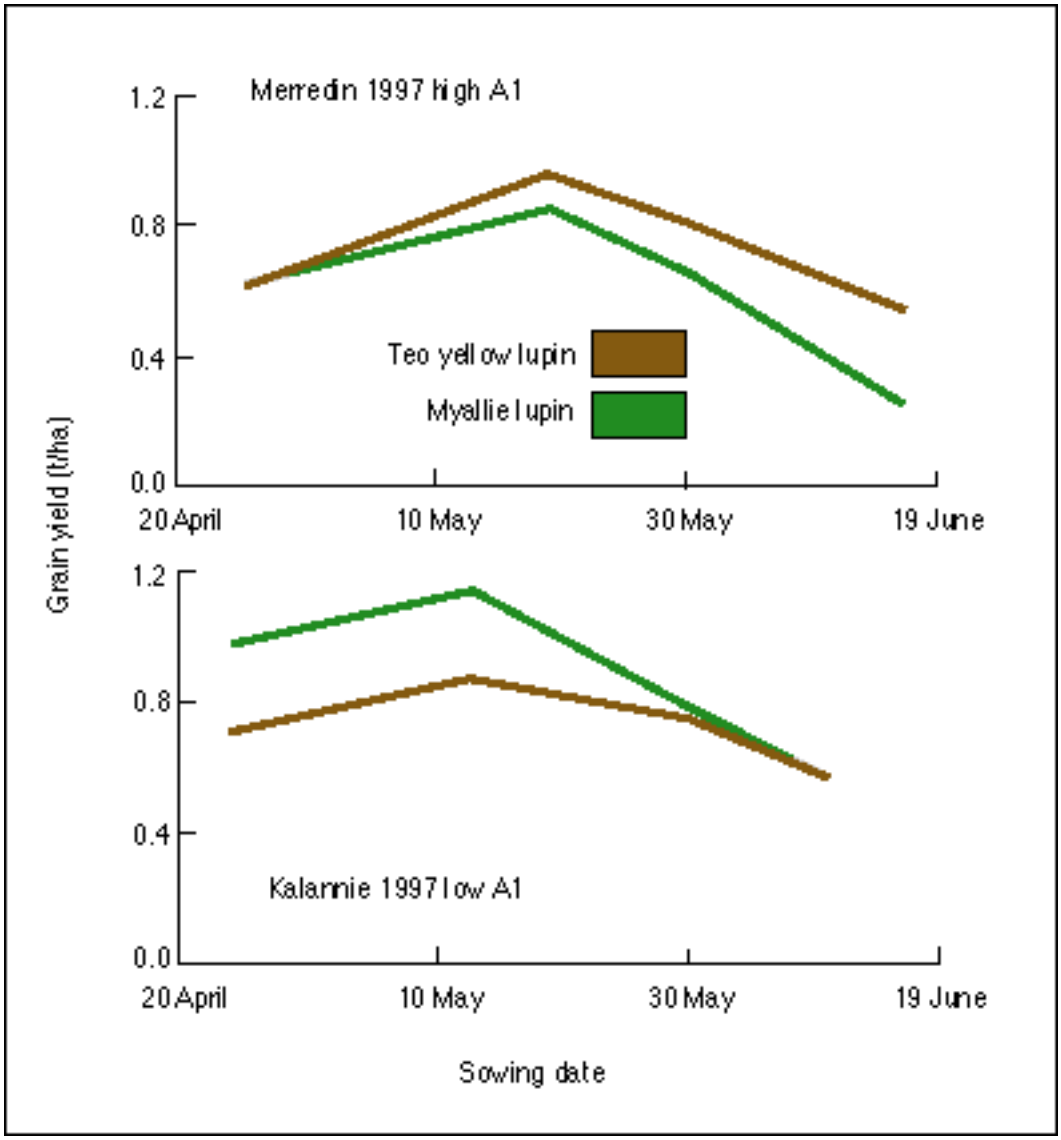

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