# Wide rows don't work for albus lupin.

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### Key messages

- Amira albus lupin is a good break crop option for high and medium rainfall areas of the northern region
- Albus lupin grown in 44 cm rows yielded 81% of 22 cm rows
- Maintaining a high seed rate maximised yield at both 22 and 44 cm row spacing's
- In dry conditions fungal disease were not evident, therefore we could not assess the impact of row spacing and density on foliar diseases.

### Aims

1) To test the yield response of albus lupin to lower than normal seeding rates and wider than normal row spacings.

2) To test if using low seeding rates and/or wide rows would reduce the incidence and impact of fungal diseases including sclerotinia and anthracnose.

### Background

Albus lupin has in recent years enjoyed a resurgence in popularity around the Geraldton region. This has come on the back of the release of new varieties, Andromeda and Amira, which have acceptable anthracnose tolerance. Strong prices have also been a major driver of the increased area sown.

In Autumn 2015 at a workshop organised by Pulse Australia growers were keen to explore the options of lower seeding rates and wider rows as a means of cutting input costs and combating fungal diseases including anthracnose and sclerotinia. Previous wide row trials on albus lupin appeared to show they were less suited to wide rows than narrow leaf lupin. However, these trials were run in the dry 2006 and 2007 years and as such yields were variable.

### Method

A field trial was sown at Moonyoonooka, (15 km east of Geraldton) using the albus lupin cultivar Amira. Treatments included 3 seeding rates, 60, 90 and 120 kg/ha and 2 row spacing's of 22 and 44 cm. The design was a factorial laid out in a latinised randomisation with 4 replicates (24 plots). Plots were 20 m long by two cone seeder runs (3.0 m wide). The trial was sown on the May 5 and measurements included; establishment counts, ratings of ground cover and flowering percentage, biomass cuts, yield and grain quality.

### Results

*Seasonal conditions*

The trial was sown into drying soil on May 5. Most seed germinated on soil moisture at sowing. The next significant rainfall after sowing occurred on May 17. Rainfall over the season was below the long term May to Oct average of 382 mm at 184 mm.

**Table 1.** Rainfall and temperature BOM site 8315, Geraldton airport

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | GSR May-Oct |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rain (mm)** | 0.00 | 12.2 | 87.2 | 37.6 | 16.4 | 54.0 | 54.4 | 48.6 | 9.8 | 0.8 | 184.0 |
| **Av. Temp (°c)** | 33.6 | 32.5 | 30.6 | 28.0 | 24.6 | 23.3 | 20.9 | 25.1 | 25.3 | 27.7 | |

### *Establishment and growth*

Establishment ranged from 5 to 26 plants/m$^2$ depending on the treatment (Table 2). These plant numbers were very low given the seed rates used. The proportion of seed which actually emerged ranged from 70% for the 120 kg/ha rate on 22 cm spacings to 30% for the 60 kg/ha rate at 44 cm spacing. Averaged over the seed rates the emergence percentage was 67 for the 22 cm rows and 37 for the 44 cm rows. With the seeding conditions being very dry it is likely that some of this difference was the result of increased competition between albus lupin seedlings within the 44 cm row spacing. However other changes in seeding procedure such as changed sowing depth or soil throw may also have occurred. We confirmed these plant populations by counting stems after harvest as a double check.

Ground cover on August 6 was lower at lower seed rates and in the wider rows (Table 2). This was also observed on August 13 with the wide row low seeding rate treatment having a ground cover of 79% ground area compared to all the other treatments being 95% or greater. With confirmations of Beet Western Yellows Virus in albus lupin around the Geraldton area it should be kept in mind that increased area of bare earth will increase the risk of aphid landings and virus infection. Hence if using wide rows or low seed rates there should be good stubble cover to counter the reduced rate of ground area cover of the crop.

The percentage of plants flowering in each treatment was similar on July 9. By July 23 there were some differences in flowering caused by the treatments. Lower seed rates had a lower flowering percentage and the wider rows had a lower flowering percentage. However flowering in all treatments progressed rapidly and by August 6 all treatments were at 100% flower.

Dry matter cuts were taken on Aug 26. The lower seed rate treatments had less biomass, 60 kg/ha - 86% of the 120 kg/ha treatment, but this was not statistically significant. Row spacing did have a significant effect ($P < 0.001$) on biomass production, 44 cm rows produced 77% of the dry weight of 22 cm rows. There was not a statistically significant seed rate by row spacing interaction but the trends showed that low seed rate x wide rows produced the least biomass while the high seeding rate x narrow rows produced the most biomass.

Individual plant weights were calculated from the August plant cuts. Plants in the 60 kg/ha seeding rate weighed 153% those of in the 120 kg/ha seeding rate - significantly more ($P < 0.001$). While plants in the wider rows weighed more than those in 22 cm rows (117%) this was not a significant difference. The trends were the opposite of total biomass with the largest plants in the low seed rate x wide row treatment and the smallest plants in the high seed rate x narrow row spacing treatment.

Overall the plants grew as expected according to the imposed treatments. In wider rows, plants took longer to achieve canopy closure, which has been shown previously to reduce radiation interception and biomass. There was very little fungal disease observed which was not surprising given the dry winter conditions. No difference in disease was observed between seed rate and row spacing treatments.

**Table 2.** Establishment and plant growth measurements: Plants/m$^2$, % Ground Cover, % of plants flowering, Dry Matter (g/m$^2$), and Plant weight (g/plant)

| Row spacing (cm) | Seed rate (kg/ha) | Plants/m$^2$ 11/6 | %GC 6/8 | %GC 13/8 | Flo% 9/7 | Flo% 23/7 | Flo% 6/8 | DM/m$^2$ 26/8 | Plant wt. 26/8 |
|---|---|---|---|---|---|---|---|---|---|
| 22 | 60 | 11 | 85 | 95 | 20 | 64 | 100 | 715 | 47 |
| 22 | 90 | 18 | 97 | 99 | 27 | 70 | 100 | 748 | 41 |
| 22 | 120 | 26 | 96 | 99 | 39 | 83 | 100 | 780 | 35 |
| 44 | 60 | 5 | 74 | 79 | 23 | 53 | 100 | 516 | 63 |
| 44 | 90 | 10 | 85 | 96 | 31 | 65 | 100 | 553 | 46 |
| 44 | 120 | 16 | 94 | 99 | 19 | 73 | 100 | 651 | 36 |
| 22 | | 18 | 93 | 98 | 29 | 72 | 100 | 748 | 41 |
| 44 | | 10 | 84 | 91 | 24 | 63 | 100 | 573 | 48 |
| | 60 | 8 | 79 | 87 | 21 | 58 | 100 | 615 | 55 |
| | 90 | 14 | 91 | 97 | 29 | 68 | 100 | 651 | 44 |
| | 120 | 21 | 95 | 99 | 29 | 78 | 100 | 715 | 36 |
| Row spacing | | P < 0.001 | P < 0.05 | P < 0.001 | NS | P < 0.001 | NS | P < 0.001 | NS |
| Seed rate | | P < 0.001 | P < 0.05 | P < 0.05 | NS | P < 0.05 | NS | NS | P < 0.001 |
| row x rate | | NS | NS | P < 0.05 | NS | NS | NS | NS | NS |

%GC = Ground cover %, Flo% = Flowering %

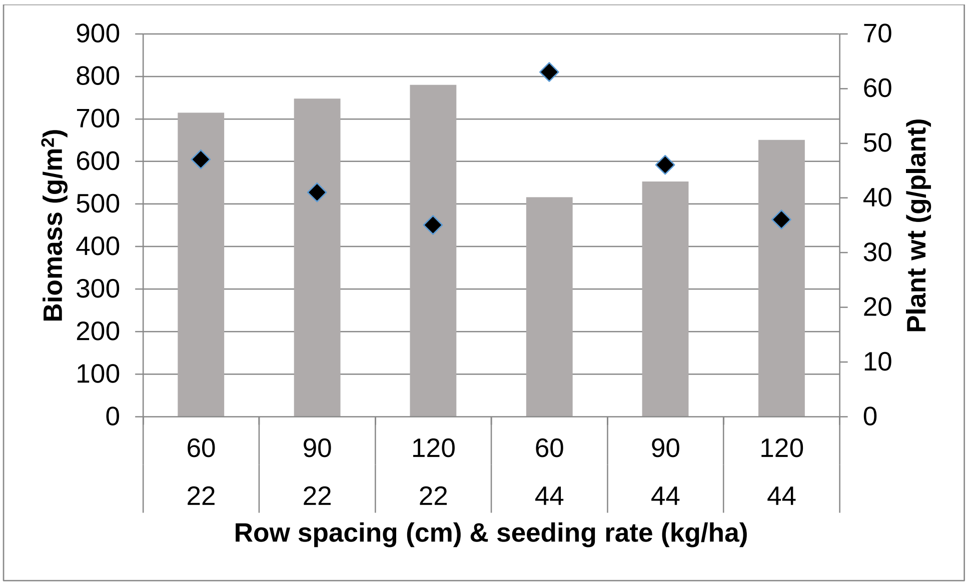


**Figure 1.** Total biomass production (bars) and single plant weight (points) Aug 26. Low seeding rate wide rows produced the least total biomass but had the greatest individual plant weight.

### *Yield and grain quality*

Site yield was 2250 kg/ha, the highest yielding treatment yielded 2757 kg/ha and the lowest 1773 kg/ha.

There was a significant reduction in yield at the wider row spacing ($P < 0.001$). Averaged across all the seeding rates yield in 44cm wide rows was 2024 kg/ha compared to 2475 kg/ha in 22 cm rows. There was a significant reduction in yield with reduced seed rate. Averaged across the two row spacing's yield from 60 kg/ha was 1991 kg/ha, 90kg/ha 2253 kg/ha and 120 kg/ha 2505 kg/ha. As discussed conditions were difficult for establishment and these seed rates correspond to very low plant populations of 8, 14 and 21 plants/$m^2$.

There was no interaction between row spacing and seed rate. For 22 cm rows the function y (yield kg/ha) = 9.1x + 1653 fitted the data well $R^2$ 0.9 where x = seed rate in kg/ha. For the 44 cm rows a linear function was also fitted y (yield kg/ha) = 8.0x + 1303 $R^2$ 0.9. Hence the slope, or change in yield due to seed rate was much the same at 22 and 44 cm (Figure 2).

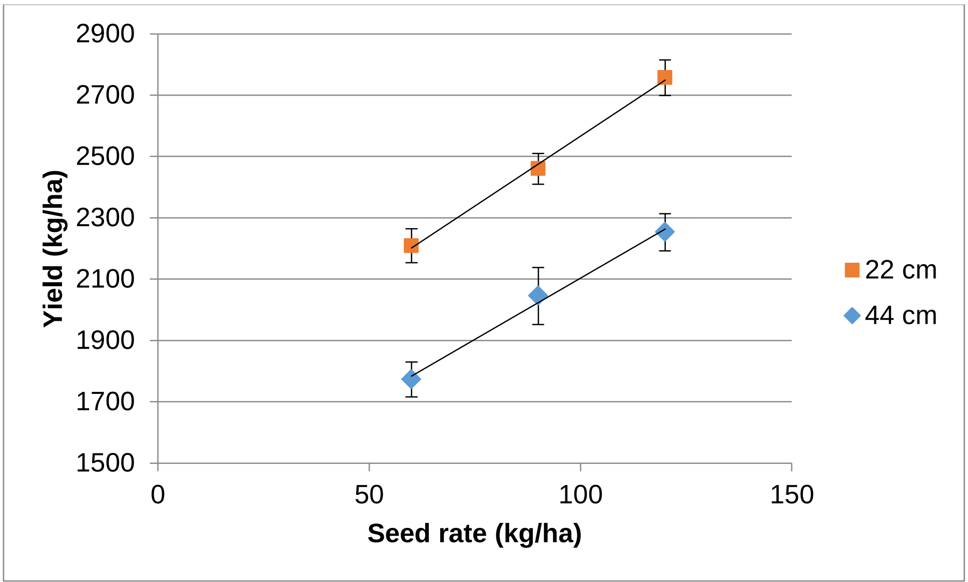


**Figure 2.** Response of albus lupin yield to row spacing and seed rate treatments.

## Conclusion

Yield was highest in the narrow row/high seed rate treatment and lowest in the wide row/low row spacing treatment and followed a consistent trend of reduced yield with wider spacing and lower seed rates. These results and the results of 2006 and 2007 trials indicate that albus lupin is not well adapted to wide rows. Hence the reduction in yield loss to fungal pathogens by sowing in wide rows would need to be substantial to justify moving to wide rows.

## Key words

Albus lupin, row spacing, seed rate

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