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# Lupin diseases

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## Recommended Citation

Wood, P M. (1983), *Lupin diseases*. Department of Agriculture and Food, Western Australia, Perth. Report.

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Department of Agriculture

Western Australia

SUMMARY OF EXPERIMENTAL RESULTS 1983

Lupin Diseases

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Table 1. Fungicide treatment of lupin seed - 83 GE 45

| Treatment<br>(Rovral, g/kg)  | Germination<br>(nos/m <sup>2</sup> ) | Hypocotyl<br>(0-5) | Disease assessments |                             | Yield<br>(t/ha) |
|------------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
|                              |                                      |                    | Root<br>(0-5)       | Brown spot<br>(defoliation) |                 |
| Infected lupin trash absent  |                                      |                    |                     |                             |                 |
| 1.25S <sup>†</sup>           | 19.5                                 | 1.1                | 0.5                 | ND*                         | 0.81            |
| 1.25D <sup>†</sup>           | 22.5                                 | 1.0                | 0.4                 |                             | 0.78            |
| 2.50S                        | 22.5                                 | 0.9                | 0.4                 |                             | 0.80            |
| 2.50D                        | 20.7                                 | 1.2                | 0.5                 |                             | 0.80            |
| Control                      | 18.0                                 | 1.0                | 0.5                 |                             | 0.83            |
| Infected lupin trash present |                                      |                    |                     |                             |                 |
| 1.25S                        | 17.7                                 | 0.9                | 0.3                 | ND*                         | 0.49            |
| 1.25D                        | 16.2                                 | 1.1                | 0.3                 |                             | 0.55            |
| 2.50S                        | 16.8                                 | 1.0                | 0.3                 |                             | 0.51            |
| 2.50D                        | 23.1                                 | 1.1                | 0.3                 |                             | 0.48            |
| Control                      | 15.9                                 | 1.3                | 0.3                 |                             | 0.54            |

<sup>†</sup> S = slurry, D = dust

\* Poor, weedy site - defoliation counts not done

Fungicide treatments had no effect on the low levels of hypocotyl and root disease. Brown spot was severe on the block which was not inoculated with infected trash and very severe (almost total leaf-loss on 10-12 leaf seedlings) on the inoculated block. Seed treatments did not control the disease probably because of very high inoculum pressure. The addition of infected lupin trash depressed yield by 36% due to a combination of higher levels of brown spot and a depression of germination.

Table 2. Fungicide treatment of lupin seed - 83 GE 46

| Treatment<br>(Rovral, g/kg)  | Germination<br>(nos/m <sup>2</sup> ) | Hypocotyl<br>(0-5) | Disease assessments |                             | Yield<br>(t/ha) |
|------------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
|                              |                                      |                    | Root<br>(0-5)       | Brown spot<br>(defoliation) |                 |
| Infected lupin trash absent  |                                      |                    |                     |                             |                 |
| 1.25S                        | 20.4                                 | 0.5                | 0.2                 | 0.5                         | 1.89            |
| 1.25D                        | 16.8                                 | 0.7                | 0.2                 | 0.8                         | 1.79            |
| 2.50S                        | 19.2                                 | 0.5                | 0.2                 | 0.6                         | 1.87            |
| 2.50D                        | 18.9                                 | 0.7                | 0.2                 | 0.8                         | 1.84            |
| Control                      | 18.0                                 | 0.4                | 0.2                 | 0.7                         | 1.75            |
| Infected lupin trash present |                                      |                    |                     |                             |                 |
| 1.25S                        | 19.5                                 | 0.6                | 0.3                 | ND*                         | 1.29            |
| 1.25D                        | 20.4                                 | 0.6                | 0.2                 |                             | 1.30            |
| 2.50S                        | 21.0                                 | 0.8                | 0.2                 |                             | 1.38            |
| 2.50D                        | 22.2                                 | 0.7                | 0.2                 |                             | 1.14            |
| Control                      | 16.8                                 | 0.6                | 0.2                 |                             | 1.09            |

\* Severe brown spot-defoliation counts not done

In the block not inoculated with infected trash, fungicide treatments had no effect on the very low level of hypocotyl and root disease, and brown spot. The addition of infected lupin trash resulted in severe disease (6 to 8 leaves lost from 10 to 12 leaf seedlings) with no apparent treatment effect. However, plants partly recovered but yields were depressed by 32%, compared with the uninoculated block.

Table 3. Fungicide treatment of lupin seed - 83 GE 47

| Treatment<br>(Rovral, g/kg)  | Germination<br>(nos/m <sup>2</sup> ) | Hypocotyl<br>(0-5) | Disease assessments |                             | Yield<br>(t/ha) |
|------------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
|                              |                                      |                    | Root<br>(0-5)       | Brown spot<br>(defoliation) |                 |
| Infected lupin trash absent  |                                      |                    |                     |                             |                 |
| 1.25S                        | 25.2                                 | 0.4                | 0.4                 | 2.6                         | 1.34            |
| 1.25D                        | 25.5                                 | 0.2                | 0.5                 | 2.7                         | 1.22            |
| 2.50S                        | 24.0                                 | 0.3                | 0.5                 | 2.5                         | 1.33            |
| 2.50D                        | 24.0                                 | 0.2                | 0.4                 | 2.5                         | 1.28            |
| Control                      | 27.9                                 | 0.3                | 0.5                 | 2.8                         | 1.35            |
| Infected lupin trash present |                                      |                    |                     |                             |                 |
| 1.25S                        | 27.3                                 | 0.1                | 0.5                 | 4.7                         | 1.10            |
| 1.25D                        | 26.4                                 | 0.3                | 0.4                 | 4.2                         | 1.06            |
| 2.50S                        | 27.3                                 | 0.3                | 0.4                 | 4.8                         | 1.14            |
| 2.50D                        | 25.2                                 | 0.3                | 0.5                 | 4.4                         | 0.96            |
| Control                      | 29.1                                 | 0.4                | 0.4                 | 4.6                         | 1.10            |

There was no effect of fungicide treatment on disease. Adding infected lupin trash resulted in higher levels of brown spot with an 18% yield depression.

Table 4. Fungicide treatment of lupin seed - 83 TS 33

| Treatment<br>(Rovral, g/kg)  | Germination<br>(nos/m <sup>2</sup> ) | Hypocotyl<br>(0-5) | Disease assessments |                             | Yield<br>(t/ha) |
|------------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
|                              |                                      |                    | Root<br>(0-5)       | Brown spot<br>(defoliation) |                 |
| Infected lupin trash absent  |                                      |                    |                     |                             |                 |
| 1.25S                        | 22.2                                 | 0.3                | 0.1                 | 5.1                         | 1.64            |
| 1.25D                        | 25.2                                 | 0.3                | 0.1                 | 4.5                         | 1.70            |
| 2.50S                        | 25.8                                 | 0.3                | 0.1                 | 4.8                         | 1.68            |
| 2.50D                        | 27.0                                 | 0.3                | 0.1                 | 4.9                         | 1.77            |
| Control                      | 25.8                                 | 0.5                | 0.2                 | 5.3                         | 1.46            |
| Infected lupin trash present |                                      |                    |                     |                             |                 |
| 1.25S                        | 21.3                                 | 0.1                | 0.4                 | 5.1                         | 1.69            |
| 1.25D                        | 24.9                                 | 0.1                | 0.3                 | 5.8                         | 1.86            |
| 2.50S                        | 27.6                                 | 0.1                | 0.2                 | 5.7                         | 1.93            |
| 2.50D                        | 26.4                                 | 0.2                | 0.2                 | 5.4                         | 1.81            |
| Control                      | 24.3                                 | 0.2                | 0.2                 | 6.5                         | 1.60            |

There was only a slight effect of fungicide treatment on levels of brown spot in both blocks, and a reduction in the low levels of hypocotyl and root disease present in the uninoculated block. The slurry application of fungicide at the high rate gave a 15% and 21% yield response in the uninoculated and trash-inoculated blocks respectively.

Table 5. Fungicide treatment of lupin seed - 83 ME 54

| Treatment<br>(Rovral, g/kg)  | Germination<br>(nos/m <sup>2</sup> ) | Hypocotyl<br>(0-5) | Disease assessments |                             | Yield<br>(t/ha) |
|------------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
|                              |                                      |                    | Root<br>(0-5)       | Brown spot<br>(defoliation) |                 |
| Infected lupin trash absent  |                                      |                    |                     |                             |                 |
| 1.25S                        | 46.2                                 | 0.2                | 0.3                 | 1.5                         | 1.19            |
| 1.25D                        | 44.7                                 | 0.1                | 0.2                 | 2.0                         | 1.14            |
| 2.50S                        | 47.4                                 | 0.3                | 0.3                 | 1.6                         | 1.17            |
| 2.50D                        | 43.2                                 | 0.2                | 0.3                 | 1.4                         | 1.18            |
| Control                      | 56.1                                 | 0.1                | 0.2                 | 5.9                         | 1.15            |
|                              |                                      |                    |                     |                             | N.S.D.          |
| Infected lupin trash present |                                      |                    |                     |                             |                 |
| 1.25S                        | 44.7                                 | 0.04               | 0.1                 | 5.0                         | 1.04            |
| 1.25D                        | 40.8                                 | 0.1                | 0.1                 | 3.3                         | 0.97            |
| 2.50S                        | 44.7                                 | 0.1                | 0.2                 | 5.7                         | 1.02            |
| 2.50D                        | 39.9                                 | 0.1                | 0.1                 | 3.8                         | 1.02            |
| Control                      | 56.7                                 | 0.1                | 0.2                 | 6.8                         | 1.02            |
|                              |                                      |                    |                     |                             | N.S.D.          |

In this trial, germination was slightly affected by fungicide treatment.

Very low levels of hypocotyl and root disease were present. A moderate level of brown spot infection was present in controls. Fungicide seed treatments gave some control of the disorder in the block which was not trash-inoculated. This was not reflected in yields, possibly because of the affect of germination. Adding lupin trash resulted in a yield reduction of 13%.

Fungicide applied as a dust gave some control of brown spot in the trash-inoculated block, but affected germination more than did the slurry treatment. The slurry treatment did not control the disease in this block.

Table 6. Fungicide treatment of lupin seed in polyculture - 83 NO 48

| Treatment<br>(Rovral, g/kg) | Lupin:cereal<br>(%) | Disease assessments |               |                             |
|-----------------------------|---------------------|---------------------|---------------|-----------------------------|
|                             |                     | Hypocotyl<br>(0-5)  | Root<br>(0-5) | Brown spot<br>(defoliation) |
| No treatment                | 0:100               | -                   | -             | -                           |
|                             | 20: 80              | 0.40                | 0.03          | 1.27                        |
|                             | 50: 50              | 0.47                | 0.03          | 0.75                        |
|                             | 80: 20              | 0.38                | 0.02          | 0.95                        |
|                             | 100: 0              | 0.55                | 0.05          | 1.38                        |
| 1.25                        | 0:100               | -                   | -             | -                           |
|                             | 20: 80              | 0.35                | 0.0           | 1.10                        |
|                             | 50: 50              | 0.22                | 0.0           | 0.95                        |
|                             | 80: 20              | 0.42                | 0.03          | 0.67                        |
|                             | 100: 0              | 0.30                | 0.10          | 0.90                        |
| 2.50                        | 0:100               | -                   | -             | -                           |
|                             | 20: 80              | 0.38                | 0.0           | 1.12                        |
|                             | 50: 50              | 0.27                | 0.05          | 0.92                        |
|                             | 80: 20              | 0.28                | 0.02          | 0.72                        |
|                             | 100: 0              | 0.47                | 0.02          | 0.72                        |

The trial was not harvested because of severe capeweed infestation which occurred during the spring.

Only very low levels of disease occurred. There appeared to be a slight effect of fungicide seed treatment on levels of hypocotyl disease and brown spot.



Table 7. Fungicide treatment of lupin seed in polyculture - 83 BU 21

| Treatment<br>(Rovral, g/kg) | Lupin:cereal<br>(%) | Brown spot<br>(defoliation) | Yield<br>(t/ha) |
|-----------------------------|---------------------|-----------------------------|-----------------|
| No treatment                | 0:100               | -                           | 1.82            |
|                             | 20: 80              | 7.7                         | 2.18            |
|                             | 50: 50              | 9.0                         | 2.40            |
|                             | 80: 20              | 9.1                         | 2.57            |
|                             | 100: 0              | 9.5                         | 2.93            |
| 1.25                        | 0:100               | -                           | 1.72            |
|                             | 20: 80              | 11.7                        | 1.55            |
|                             | 50: 50              | 8.8                         | 2.21            |
|                             | 80: 20              | 8.3                         | 2.79            |
|                             | 100: 0              | 8.8                         | 2.51            |
| 2.50                        | 0:100               | -                           | -               |
|                             | 20: 80              | 9.3                         | 1.76            |
|                             | 50: 50              | 10.0                        | 1.70            |
|                             | 80: 20              | 8.3                         | 2.04            |
|                             | 100: 0              | 7.8                         | 2.51            |

Oats were affected by the SSH herbicide treatment. There was some phytotoxicity in the high rate of Rovral treatment. Only two replicates of the trial were sown. Late infection, after the fungicidal effect would no longer be apparent, occurred. Therefore an interpretation of the results is not possible.

83 ME 69

This trial was designed to assess the role of Phomopsis-infected lupin seed in introducing the fungus to an area not previously cropped to lupins.

It failed and was abandoned early in the season.

Brown spot of lupins - survival of Pleiochaeta the causal organism.

A bio-assay has been developed to assess the levels of infection in crop residues after disease. Six paddocks with the following histories were sampled in the Geraldton district in July.

- Site 1. Brown spot 1981, cereal 1982, 1983
2. Brown spot (severe) 1982, cereal 1983
3. Brown spot 1981, cereal 1982, lupins 1983
4. Brown spot 1982, cereal 1983
5. Brown spot (moderate) 1981, wheat 1982, barley 1983
6. Brown spot (severe) 1981, cereal 1982, lupins 1983

Sites 1, 2 and 3, 4 are paired paddocks.

Table 8. Levels of Pleiochaeta in different organic fractions

| Site | Lupin stem pieces of soil surface | Percentage of particles with viable <u>Pleiochaeta</u> |         |       |                                      |         |       |
|------|-----------------------------------|--|---------|-------|--------------------------------------|---------|-------|
|      |                                   | Lupin  |         |       | Cereal and grasses                   |         |       |
|      |                                   | Organic material in top 3 cm of soil                   |         |       | Organic material in top 3 cm of soil |         |       |
|      |                                   | Particle size (mm)                                     |         |       | Particle size (mm)                   |         |       |
|      |                                   | > 2.5  | 1.2-2.5 | < 1.2 | > 2.5                                | 1.2-2.5 | < 1.2 |
| 1.   | 4.2                               | 35.0   | 77.3    | 2.0   | 25.8                                 | 44.8    | -     |
| 2.   | 10.7                              | 37.4   | 100.0   | 15.2  | 5.0                                  | 31.1    | -     |
| 3.   | 0.0                               | 40.8   | 13.7    | 37.6  | 39.5                                 | 47.6    | -     |
| 4.   | 2.5                               | 31.6   | 88.9    | 37.9  | 88.2                                 | 48.1    | -     |
| 5.   | 0.0                               | 95.8   | 83.3    | 19.1  | 23.7                                 | 46.7    | -     |
| 6.   | 0.0                               | 42.8   | 20.0    | 22.4  | 63.7                                 | N.D.    | -     |

Thus Pleiochaeta could be recovered from lupin stem fragments on the soil surface the year following infection, but was not recovered in the subsequent year.

Comparing paired paddocks, the fungus was recovered with about the same frequency from larger lupin fragments in the top 3 cm of soil regardless of whether infection originated in 1981 or 1982. However, there was a decline in the recovery rate from smaller lupin fragments from 1981 infected crops in the paired paddock comparison.

Of particular interest was the observation that cereal and grass residues could carry the fungus and in some cases were carrying higher levels of infection than the corresponding lupin fraction. Sites will be further sampled in 1984.

83 AL 51 (2 sites)

Trials by Albany District Office to examine the effect of nutritional factors on a poor-growth problem in the district were also assessed for Phomopsis. The results are shown in the table.

Table 9. Phomopsis levels on post-harvest samples - 83 AL 51

| Potassium | Treatment |          | Phomopsis rating (0-5) |           |            |           |
|-----------|-----------|----------|------------------------|-----------|------------|-----------|
|           | Inoculant | Nitrogen | Site A                 |           | Site B     |           |
|           |           |          | Early sown             | Late sown | Early sown | Late sown |
| -         | -         | -        | 2.3                    | 0.7       | 2.8        | 2.4       |
| -         | -         | +        | 1.7                    | 0.5       | 2.7        | 2.3       |
| -         | WU 425    | +        | 1.4                    | 0.5       | 3.1        | 2.0       |
| -         | WSM 467   | +        | 1.9                    | 0.2       | 2.7        | 2.2       |
| -         | WSM 470   | +        | 1.7                    | 0.5       | 2.8        | 1.8       |
| +         | -         | -        | 1.5                    | 0.5       | 2.6        | 2.1       |
| +         | -         | +        | 1.9                    | 0.4       | 2.9        | 2.1       |
| +         | WU 425    | +        | 1.8                    | 0.4       | 2.9        | 2.1       |
| +         | WSM 467   | +        | 1.5                    | 0.4       | 2.8        | 1.8       |
| +         | WSM 470   | +        | 1.6                    | 0.3       | 2.8        | 1.7       |

Thus site B had higher levels of infection than site A. The only consistent treatment effect was at site A, where, in the absence of potassium and inoculant, the addition of nitrogen resulted in lower levels of Phomopsis in the early sown trial. The late-sown trial at both sites had lower Phomopsis levels in all treatments than the early-sown trial.