1979 summary of experiments

T N. Khan

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1. General Comments and Highlights
2. Barley Disease Survey 1979
3. Studies in Inter-Plot Interference
4. Design and Assessment of Disease Nurseries
5. Scald: Crop Loss Assessment Studies
6. Scald: Genotype x Fungicide x Date of Planting Studies
7. Net-Blotch: Crop Loss Assessment Studies
8. Net-Blotch: Genotype x Fungicide x Date of Planting Studies
9. Powdery Mildew: Studies in Genotype x Fungicide

T.N. Khan
PLANT PATHOLOGY BRANCH
PLANT RESEARCH DIVISION
1. **GENERAL COMMENTS AND HIGHLIGHTS**

**EXPERIMENTAL**

1. In scald and net blotch experiments infections were initiated by spreading infected barley straw. In powdery mildew experiments, infected live barley plants in pots were placed in each plot.

2. Levels of significance have been indicated as * = \(P<0.05\); ** = \(P<0.01\); *** = \(P<0.001\). Treatments indicated with the same letter do not differ significantly at 0.05 probability level.

3. Disease was scored on all available leaves of ten randomly chosen tillers in each plot. 79MT22 was an exception where 50 tillers were sampled from each plot.

**RESULTS**

1. Appearance of spot type bioform of net-blotch is significant as it attacks Clipper. Clipper has enjoyed almost complete immunity in the field from the "usual" net-form of this fungus.

2. Up to 42% reduction in yield due to scald damage was recorded on variety Clipper in Mt. Barker in a mid-season sown experiment (79MT22). Two late sprays or one early and one late spray were very effective in controlling scald and open the possibility of investigating economic fungicidal control specially in early planted crops (79MT22).

3. A breeding line 74-0012 from the University of W.A. was confirmed to be field resistant to net blotch. This line was produced through four back crossings to Dampier, and appears similar to Dampier in all agronomic traits including yield. This can now be used as an isogenic line in crop loss assessment trials (79BA25).

4. A reliable scoring system for leaf diseases and a satisfactory design for disease nursery are suggested in a Mt. Barker experiment (79MT49).

5. In experiments where negligible amount of scald was recorded and where no significant yield differences are noted, control is consistently lower yielding than Benlate treatments. Possibility of growth promoting effects of Benlate is thus raised and, crop loss estimates in experiment 79MT22 may represent a small degree of over estimation.
2. **BARLEY DISEASE SURVEY 1979**

**OBJECTIVE**

To study severity and distribution of various barley diseases.

**EXPERIMENTAL**

Twenty tillers of each of the three varieties were sampled from Cultivar variety trials.

**RESULTS**

See Table 2.1

**COMMENTS**

Disease levels were very low due to drought conditions. The dry conditions in mid winter and early spring were presumably responsible. Net blotch was more generally distributed on Dampier wherever it was grown. Clipper continued to show resistance to conventional biotypes of net blotch. Scald continued to be more widespread in high and medium rainfall areas. General patterns of distribution of all diseases remained the same as in previous surveys.

Of significance is a new biotype of net blotch referred to as spot type. This biotype appears to have become more prevalent in the Northern Zone but samples have been received from other areas as well. Significantly Clipper is as susceptible to this biotype of net blotch as any other of the commercial varieties. However the extent to which grain yield can be reduced as a result of the infection with the spot type net blotch is not clear.
## TABLE 241: MEAN LEAF AREA INFECTED ON UPPER THREE LEAVES

<table>
<thead>
<tr>
<th>Disease/Variety</th>
<th>Rainfall Zone</th>
<th>Growing Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td><strong>Scald</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beecher</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Clipper</td>
<td>0.9</td>
<td>0.2</td>
</tr>
<tr>
<td>Dampier</td>
<td>1.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Mean</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Net Blotch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beecher</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Clipper</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dampier</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Mean</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Powdery Mildew</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beecher</td>
<td>6.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Clipper</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Dampier</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Mean</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>18.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>
3. **STUDIES IN INTER- PLOT INTERFERENCE**

**OBJECTIVES**

To study the inter-plot interference at various distances in Barley Scald and Net Blotch.

**EXPERIMENTAL**

Basic design was the same in all experiments. It consisted of a source plot 5 x 5m with 1 x 1m plots situated at distances of 1, 2, 5 and 10m on four sides. The position of various distances was randomized first and then position of each treatment was rotated in clockwise fashion so that each treatment was represented once in each direction. A sample layout of one replication of 79WH17 is presented as follows as an example (fig. 3.1).

Two replications were used in each experiment. Locations of experiments were as follows:

Net-Blotch : Research Stations Badgingarra (79BA24), Wongan Hills (79WH17).

Scald : Research Stations Badgingarra (79BA21), Mt. Barker (79MT23).

Inoculum was added to the source plot (5 x 5m) to initiate epidemic. Level of infection in source plots as well as 1 x 1m plots was recorded at heading.

**RESULTS**

Net Blotch: Infection failed to develop in 79BA24, therefore only data from 79WH17 is presented. Analysis of variance showed no significant difference between treatments due to large coefficients of variation in both the mean infected leaf area (169%) as well as proportion of infected plants (143%). This may have been caused due to poor infection in the source plot as a result of adverse weather conditions for disease development.
Fig. 3.1  79WH17
NET BLOTCH: INTERPLOT INTERFERENCE
- Oat buffer, approx. 1 drill width.
- 5 x 5 m Dampier barley (infection source)
FIG. 3.2: TRANSMISSION OF INFECTION OF NET BLOTCH FROM SOURCE PLOT TO PLOTS SITUATED AT VARIOUS Distances AT WONGAN HILLS

Scald: At Mt. Barker none of the treatments were significantly different. At Badgingarra significant differences were found in proportion of infected plants and main effects distance from source plot (P<0.01), direction (P<0.001) and interactions (P<0.05) were all significantly different. Results are summarized in figs. 3.3 - 3.4.
FIG. 3.3: TRANSMISSION OF SCALD INFECTION FROM SOURCE PLOT TO VARIOUS DISTANCES BASED ON ESTIMATES OF MEAN LEAF AREA INFECTED

- Mt. Barker
- Badgingarra
FIG. 3.4: TRANSMISSION OF SCALD INFECTION FROM SOURCE PLOT TO VARIOUS DISTANCES BASED ON ESTIMATES OF PROPORTION OF INFECTED PLANTS
COMMENTS

(1) Lack of significance in Badgingarra and Wongan Hills experiments may be due to low level of infection in source plots and in Mt. Barker due to high level of natural infection. As a result any conclusions drawn here are tentative.

(2) In 79BA21 (Scald) plots situated in the West had significantly more infection than those in North or South etc. In other experiments, although not significant, such differences were evident. This indicates the significance of direction in conducting such experiments.

(3) Present data would indicate an optimum inter-plot distance of 1 metre in scald experiment, 2 metres in net blotch experiments.
4. DESIGN AND ASSESSMENT OF DISEASE NURSERIES

OBJECTIVES

A pilot project to study the variation of disease reaction within genotypes in screening the breeding material and to test a scoring system.

EXPERIMENTAL

A common scoring system was devised for all leaf diseases. This system is based on a scale proposed by CIMMYT for cereal diseases. However it has been simplified by having four basic classes 1 - 4 (excluding 0 for no disease) for totally inexperienced recorder. For more experienced recorder finer graduations are possible by having intermediate classes. The scale is presented in fig. 4.1.

Barley breeding lines from stage 2, 3 and 4 trials together with a few controls made a total of 291 entries. They were sown in 3 metre rows with 0.5 metre inter-row distance. Design was completely randomized blocks with two replications. Every 14th plot in each block was sown with Clipper as a check and also as spreader rows. Scald nurseries were located at Mt. Barker (79MT49) and Badgingarra (79BA53) and net blotch nurseries at Badgingarra (79BA54) and Wongan Hills (79WH52).

In scald nursery powdery mildew was controlled by three sprayings of Milstem. In net blotch Benlate sprayings were done to exclude scald infection.

RESULTS

Infection failed to develop in three nurseries excepting Mt. Barker (79MT49). The nursery at Mt. Barker was scored for scald infection by the author and then by an inexperienced field assistant. Correlation between the two scorings was 0.7048*** (666 d.f.).

The scoring by the author was then examined for differences between the Replication 1 and Replication 2 scores and the data is presented in table 4.1.
COMMents

1. Correlation between scorings by experienced and inexperienced recorder showed the reliability of the proposed scale in assessing disease.

2. In Table 1, nearly 1/3 of the genotypes did not show any variation in reactions between the two replications, 2/3 showed a difference of 0.5 or less and more than 4/5 a difference of 1.0 or less. This indicates the reliability of the scale and uniformity of the infection. It does not, however, suggest that we should do away with the replication as analysis of variance showed highly significant differences between the two replications (P<0.001).

3. The experiment was analysed on two values:

   (i) Disease score (0 = 4).

   (ii) Disease scores converted to percentage of the mean of the Clipper checks on either sides of a group of 13 plots.

Coefficients of variation were 27% in disease score and 43% in adjusted percentages indicating that disease scores were more reliable, and that expressing disease score in percentage of the mean of the check plots was not desirable. The value of the check plots as spreader rows in ensuring uniform infection needs further examination.

FIG. 4.1 : FOLIAR DISEASE SCORING (1 - 4)

Modified from CIMMYT Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Free from infection.</td>
</tr>
<tr>
<td>0.5</td>
<td>Few scattered lesions on the lower quarter of the plants.</td>
</tr>
<tr>
<td>1</td>
<td>Lower quarter of the plant severely infected.</td>
</tr>
<tr>
<td>1.5</td>
<td>Lower quarter of the plant severely infected with few scattered lesions on the upper three-quarter.</td>
</tr>
<tr>
<td>2</td>
<td>Lower half of the plant severely infected.</td>
</tr>
<tr>
<td>2.5</td>
<td>Lower half of the plant severely infected with scattered lesions on the upper half.</td>
</tr>
<tr>
<td>3</td>
<td>Three-quarter of the plant severely infected.</td>
</tr>
<tr>
<td>3.5</td>
<td>Three-quarter of the plant severely infected with scattered lesions on the upper quarter.</td>
</tr>
<tr>
<td>4</td>
<td>All plant severely infected excepting the head.</td>
</tr>
<tr>
<td>4.5</td>
<td>4-type plants with head infection.</td>
</tr>
<tr>
<td>N</td>
<td>No scoring possible due to necrosis as a result of other diseases and factors.</td>
</tr>
</tbody>
</table>
NOTES

1. Severe infection implies that > 75% leaf area is infected/covered.

2. Pre-elongation infection may be rated from 0 - 1 at intervals of 0.1 indicating the approximate fraction of leaf area covered.

3. If greater precision is required, instead of expressing scattered lesions with 0.5, actual leaf area covered can be expressed in fractions of 1, e.g. 1.2 would mean that lower quarter severely infected with scattered lesions covering approximately 20% of the leaf area in upper three-quarters.

### TABLE 4.1: FREQUENCY OF DIFFERENCES BETWEEN SCORES IN REPLICATION 1 AND REPLICATION 2 AMONGST 291 GENOTYPES

<table>
<thead>
<tr>
<th>Difference [(Rep 1 - Rep 2)]</th>
<th>Frequency</th>
<th>Relative Frequency %</th>
<th>Cumulative Frequency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>95</td>
<td>32.6</td>
<td>32.6</td>
</tr>
<tr>
<td>0.5</td>
<td>99</td>
<td>34.0</td>
<td>66.6</td>
</tr>
<tr>
<td>1.0</td>
<td>52</td>
<td>17.9</td>
<td>84.5</td>
</tr>
<tr>
<td>1.5</td>
<td>16</td>
<td>5.5</td>
<td>90.0</td>
</tr>
<tr>
<td>2.0</td>
<td>16</td>
<td>5.5</td>
<td>95.5</td>
</tr>
<tr>
<td>2.5</td>
<td>4</td>
<td>1.4</td>
<td>96.9</td>
</tr>
<tr>
<td>3.0</td>
<td>7</td>
<td>2.4</td>
<td>99.3</td>
</tr>
<tr>
<td>3.5</td>
<td>2</td>
<td>0.7</td>
<td>100.0</td>
</tr>
<tr>
<td>4.0</td>
<td>0</td>
<td>0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
4. SCALD: CROP LOSS ASSESSMENT STUDIES

OBJECTIVES

To assess the yield losses due to scald, the possibility of single and double sprayings in controlling scald and to screen Bayleton's effectiveness against scald.

EXPERIMENTAL

Treatments in split plot design as follows:

Main Plots: Early vs. late planting; Sub Plots: Fungicide treatments.
Plot size 2.5 x 20m with 2.5m wheat buffer between plots.
Replications: 3.
Locations: Mt. Barker Research Station (79MT22) and Badgingarra Research Station (79BA20). Due to late start of the season early planting was considerably delayed and should be considered as mid season planting. Dates of plantings were as follows:


RESULTS

See Tables 5.1 - 5.3.
### Table 5.1: 79MT22: Disease Score, 100 Seed Weight and Grain Yield

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Disease Score %</th>
<th>100 Seed Weight g</th>
<th>Grain Yield kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Fungicide Mean</td>
</tr>
<tr>
<td>Bayleton: Week 4, 12</td>
<td>23.5 bc</td>
<td>13.7 a</td>
<td>18.6 b</td>
</tr>
<tr>
<td>Benlate: Alternate Week</td>
<td>0.5 a</td>
<td>0.1 a</td>
<td>0.3 a</td>
</tr>
<tr>
<td></td>
<td>35.8 cd</td>
<td>45.1 cd</td>
<td>40.4 c</td>
</tr>
<tr>
<td></td>
<td>59.2 e</td>
<td>49.3 d</td>
<td>54.3 de</td>
</tr>
<tr>
<td></td>
<td>7.2 ab</td>
<td>14.7 ab</td>
<td>10.9 ab</td>
</tr>
<tr>
<td></td>
<td>77.0 f</td>
<td>74.1 e</td>
<td>75.5 f</td>
</tr>
<tr>
<td></td>
<td>86.5 f</td>
<td>31.8 bc</td>
<td>59.2 e</td>
</tr>
<tr>
<td></td>
<td>34.2 cd</td>
<td>40.2 cd</td>
<td>37.2 c</td>
</tr>
<tr>
<td></td>
<td>44.7 de</td>
<td>45.4 cd</td>
<td>45.1 cd</td>
</tr>
<tr>
<td>No Fungicide</td>
<td>85.0 g</td>
<td>74.7 e</td>
<td>79.8 f</td>
</tr>
<tr>
<td>Date of Planting Mean</td>
<td>45.4 a</td>
<td>38.9 a</td>
<td>4.585 a</td>
</tr>
<tr>
<td>Mean Yield kg/ha</td>
<td>3014</td>
<td>2761</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 5.2 (79MT22)
PERCENT REDUCTION IN 100 SEED WEIGHT AND GRAIN YIELD DUE TO VARIOUS LEVELS OF SCALE IN DIFFERENT FUNGICIDE TREATMENTS

<table>
<thead>
<tr>
<th>Fungicide Treatment</th>
<th>Early Planting</th>
<th>Late Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 Seed Wt.</td>
<td>Grain Yield</td>
</tr>
<tr>
<td>Bayleton : Week 4, 12</td>
<td>3.6</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>18.3</td>
</tr>
<tr>
<td>Benlate : Alternate Week</td>
<td>0*</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4.9</td>
<td>23.4</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>4.9</td>
<td>29.0</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>22.2</td>
</tr>
<tr>
<td></td>
<td>5.2</td>
<td>12.9</td>
</tr>
<tr>
<td>No Fungicide</td>
<td>6.4</td>
<td>42.7</td>
</tr>
<tr>
<td></td>
<td>6.8</td>
<td>16.9</td>
</tr>
</tbody>
</table>

* Taken as potential 100 seed weight and grain yield in absence of disease.
TABLE 5.3: 79BA2O : DISEASE SCORE, 100 SEED WEIGHT AND GRAIN YIELD AT BADGINGARRA

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Disease Score</th>
<th>100 Seed Weight</th>
<th>Grain Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Fungicide Mean</td>
</tr>
<tr>
<td>Bayleton: Week 4, 12</td>
<td>0.56 a</td>
<td>2.30 b</td>
<td>1.43 c</td>
</tr>
<tr>
<td>Benlate: Alternate Week</td>
<td>0.00 a</td>
<td>0.08 a</td>
<td>0.04 a</td>
</tr>
<tr>
<td>&quot; : Week 4, 12</td>
<td>0.39 a</td>
<td>0.28 a</td>
<td>0.34 ab</td>
</tr>
<tr>
<td>&quot; : &quot; 4, 6</td>
<td>0.09 a</td>
<td>0.02 a</td>
<td>0.05 a</td>
</tr>
<tr>
<td>&quot; : &quot; 10, 12</td>
<td>0.05 a</td>
<td>1.11 ab</td>
<td>0.58 abc</td>
</tr>
<tr>
<td>&quot; : &quot; 4</td>
<td>0.79 a</td>
<td>0.31 a</td>
<td>0.55 abc</td>
</tr>
<tr>
<td>&quot; : &quot; 6</td>
<td>0.64 a</td>
<td>1.93 b</td>
<td>1.29 bc</td>
</tr>
<tr>
<td>&quot; : &quot; 10</td>
<td>0.10 a</td>
<td>2.26 b</td>
<td>1.18 bc</td>
</tr>
<tr>
<td>&quot; : &quot; 12</td>
<td>1.01 ab</td>
<td>4.02 c</td>
<td>2.51 d</td>
</tr>
<tr>
<td>No Fungicide</td>
<td>2.38 b</td>
<td>4.43 c</td>
<td>3.40 d</td>
</tr>
<tr>
<td>Mean</td>
<td>0.60 a</td>
<td>1.67 b</td>
<td>1.14</td>
</tr>
<tr>
<td>Mean Yield kg/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Most effective control of scald appears to be the Benlate sprays every alternate week starting from week 4. Two late sprays at 10 and 12 weeks reduced infection to a level where it was not significantly different from bi-weekly sprayings. Early sprayings appear to be relatively ineffective.

In early planting, yield losses due to scald vary between 5.9% - 42.7% and in late planting between 2.6% - 25.0%. However the corresponding reduction in 100 seed weight appears to be of much lower magnitude, and it would appear that scald infection affects yield through more than one yield component. Data on other yield components should become available by the middle of 1980.

Significant negative correlations were found between scald level and 100 seed weight ($r = -0.6266^{**}$), and scald level and grain yield ($r = -0.3868^{**}$). The linear regression coefficient of grain yield on scald was also significant and the relationship is defined as follows:

$$Y = 11.64 - 0.029X$$

Due to low levels of infection, no significant differences were found in either 100 seed weight or grain yield.

Level of scald infection however varied with the fungicide treatments. These differences were more apparent in late planting where levels of infection were relatively higher. In contrast to Mt. Barker, early sprays were more effective in Badgingarra. This may be due to the fact that there was very little secondary infection late in the season due to dry conditions.

At Mt. Barker, Bayleton appears to be more effective fungicide than Benlate when corresponding Week 4, 12 sprayings are compared, specially in view of the fact that Bayleton was used @ 1kg/ha as against a rate of 2kg/ha for Benlate. This advantage in disease control was not translated into grain yield where Benlate Weeks 4, 12 was markedly superior. This may either be due to beneficial hormonal effect of Benlate or phytotoxic effect of Bayleton.
OBJECTIVES

A pilot study to evaluate differences in field reaction of barley genotype to net blotch and associated yield variation with a view to evolve field techniques to evaluate advanced breeding material for scald resistance.

EXPERIMENTAL

Split plot arrangement in completely randomized block design as follows:

Main Plots: Sprays with Benlate every two weeks vs no fungicide; Sub Plots: Early vs late planting; Sub-Sub Plot: 14 genotypes.

Plot size 1.25 x 5m with wheat buffer plots of similar dimensions on either side.

Location: Research Stations, Badgingarra (79BA22) and Mt. Barker (79MT24).

RESULTS

See Tables 6.1 and 6.2.

COMMENTS

1. At Badgingarra in early planting six genotypes showed significant decline in scald infection due to fungicide sprayings (P<0.001) but only five of these showed yield advantage due to fungicide. Amongst three genotypes which showed significant decline in fungicide treatment (P<0.05) only one showed substantial yield advantage. However, none of the grain yield and 100 seed weight differences were significant. Correlations and regressions involving scald infection, grain yield and 100 seed weight were also not significant.

2. At Mt. Barker, although high levels of infection were observed, none of the three attributes exhibited any significant differences. Correlations between scald and grain yield and scald and 100 seed weight were negative and significant (-0.32** and -0.31** respectively). The regressions of grain yield and seed weight on scald was also significant (P<0.001) and linear relationships were defined as follows:-
Grain yield \( y = 2083 - 11.413x \)
Seed yield \( y = 4.754 - 0.0102x \)

3. Badgingarra experiment had heavy infestation with rye-grass on a part of it which may have caused variability in yield attributes. Lack of significance in Mt. Barker experiment is presumably caused by large variation in the levels of infection over the experimental block.
<table>
<thead>
<tr>
<th>Genotype</th>
<th>Disease Score %</th>
<th>Grain Yield (g)</th>
<th>100 Seed Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Early Planting</td>
</tr>
<tr>
<td></td>
<td>Fungicide</td>
<td>No Fungicide</td>
<td>Fungicide</td>
</tr>
<tr>
<td>SADAF 51/56</td>
<td>0.00</td>
<td>24.78</td>
<td>0.06</td>
</tr>
<tr>
<td>&quot; 215/51</td>
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<tr>
<td>68817-75-12</td>
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<td>4.41</td>
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<tr>
<td>68817-75-7</td>
<td>0.00</td>
<td>6.05</td>
<td>N.S.</td>
</tr>
<tr>
<td>West China</td>
<td>0.02</td>
<td>1.30</td>
<td>N.S.</td>
</tr>
<tr>
<td>68817-75-3</td>
<td>0.00</td>
<td>8.77</td>
<td>N.S.</td>
</tr>
<tr>
<td>70920-20</td>
<td>0.28</td>
<td>56.24</td>
<td>***</td>
</tr>
<tr>
<td>Betzes</td>
<td>0.00</td>
<td>60.59</td>
<td>***</td>
</tr>
<tr>
<td>Betzes Rh</td>
<td>0.00</td>
<td>5.29</td>
<td>N.S.</td>
</tr>
<tr>
<td>Hudson</td>
<td>0.00</td>
<td>0.12</td>
<td>N.S.</td>
</tr>
<tr>
<td>W.6</td>
<td>0.00</td>
<td>1.18</td>
<td>N.S.</td>
</tr>
<tr>
<td>Dampier</td>
<td>0.00</td>
<td>72.49</td>
<td>***</td>
</tr>
<tr>
<td>Clipper</td>
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<td>85.90</td>
<td>***</td>
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* Significance of difference between fungicide = no fungicide
TABLE 6.2: 79MT24: DISEASE SCORE, GRAIN YIELD AND 100 SEED WT. AT MT. BARKER

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Disease Score %</th>
<th></th>
<th>Grain Yield (g)</th>
<th></th>
<th>100 Seed Weight (g)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Early Planting</td>
<td>Late Planting</td>
</tr>
<tr>
<td></td>
<td>Fungicide</td>
<td>No Fungicide</td>
<td>Fungicide</td>
<td>No Fungicide</td>
<td>Fungicide</td>
<td>No Fungicide</td>
</tr>
<tr>
<td>SADAF 51/56</td>
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<td>7.8</td>
<td>0.0</td>
<td>8.1</td>
<td>2413</td>
<td>1827</td>
</tr>
<tr>
<td></td>
<td>215/51</td>
<td>0.0</td>
<td>33.4</td>
<td>0.0</td>
<td>31.2</td>
<td>3362</td>
</tr>
<tr>
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<td>0.0</td>
<td>25.5</td>
<td>0.3</td>
<td>7.4</td>
<td>2844</td>
</tr>
<tr>
<td>68S17-75-12</td>
<td>0.4</td>
<td>44.6</td>
<td>0.0</td>
<td>1.9</td>
<td>2113</td>
<td>1697</td>
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<td>10.9</td>
<td>0.1</td>
<td>15.4</td>
<td>1874</td>
<td>2101</td>
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<td>West China</td>
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<td>6.9</td>
<td>0.1</td>
<td>8.5</td>
<td>2027</td>
<td>1919</td>
</tr>
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<td>68S17-75-3</td>
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<td>0.1</td>
<td>0.5</td>
<td>2318</td>
<td>3175</td>
</tr>
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<td>70S20-20</td>
<td>0.7</td>
<td>27.7</td>
<td>0.1</td>
<td>10.4</td>
<td>2322</td>
<td>1816</td>
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<td>Betzes</td>
<td>0.7</td>
<td>50.2</td>
<td>0.0</td>
<td>6.6</td>
<td>1696</td>
<td>1547</td>
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<td>Betzes Rh</td>
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<td>0.2</td>
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<td>1645</td>
</tr>
<tr>
<td>Hudson</td>
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<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
<td>2649</td>
<td>2490</td>
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<td>W.6</td>
<td>0.4</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>2963</td>
<td>1677</td>
</tr>
<tr>
<td>Dampier</td>
<td>0.1</td>
<td>1.7</td>
<td>0.0</td>
<td>0.0</td>
<td>2125</td>
<td>2340</td>
</tr>
<tr>
<td>Clipper</td>
<td>0.2</td>
<td>19.5</td>
<td>0.0</td>
<td>6.9</td>
<td>2422</td>
<td>2185</td>
</tr>
</tbody>
</table>
7. **NET BLOTCH : CROP LOSS ASSESSMENT STUDIES**

**OBJECTIVES**

To estimate crop losses due to net blotch and to study the possibility of net blotch control through single spray.

**EXPERIMENTAL**

Split plot arrangement in completely randomized block design with four replications. Plot size 2.5 x 20m with 2.5m wheat buffer between plots. Main Plots: Early vs late planting; Sub Plots: Fungicidal treatments. Locations: Research Stations at Wongan Hills (79WH16) and Badgingarra (79BA23).

At Wongan Hills late planting was abandoned due to severe damage in a sand storm.

**RESULTS**

See Tables 7.1 and 7.2.

**COMMENTS**

1. At Wongan Hills level of net blotch was extremely low and differences between fungicide treatments were not significant for either disease score or grain yield.

2. At Badgingarra level of infection although marginally higher did not induce any significant differences in grain yield or 100 seed weight. Bi-weekly sprays were significantly superior in reducing net blotch infection and sprays at 3, 5 and 11 weeks were significantly better than control. In view of low level of infection these conclusions should be regarded as tentative.
### TABLE 7.1: 79BA23: EFFECT OF ROVRAL SPRAYINGS ON NET BLOTCH INFECTION, 100 SEED WEIGHT AND GRAIN YIELD AT WONGAN HILLS

<table>
<thead>
<tr>
<th>Fungicide Treatments</th>
<th>Disease Score (%)</th>
<th>Grain Yield (kg)</th>
<th>100 Seed Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td>Mean</td>
</tr>
<tr>
<td>Rovral:Alt. Week</td>
<td>0.188</td>
<td>0.095</td>
<td>0.141a</td>
</tr>
<tr>
<td>&quot; : Week 4</td>
<td>0.850</td>
<td>0.238</td>
<td>0.544ab</td>
</tr>
<tr>
<td>&quot; : &quot; 6</td>
<td>0.545</td>
<td>0.213</td>
<td>0.379ab</td>
</tr>
<tr>
<td>&quot; : &quot; 8</td>
<td>0.913</td>
<td>0.455</td>
<td>0.684bc</td>
</tr>
<tr>
<td>&quot; : &quot; 12</td>
<td>0.455</td>
<td>0.405</td>
<td>0.425ab</td>
</tr>
<tr>
<td>Control</td>
<td>1.428</td>
<td>1.750</td>
<td>1.089c</td>
</tr>
<tr>
<td>Mean</td>
<td>0.728</td>
<td>0.359</td>
<td></td>
</tr>
<tr>
<td>Yield kg/ha</td>
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<td></td>
<td></td>
</tr>
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</table>
TABLE 7.2: EFFECT OF ROVRAL SPRAYINGS ON NET BLOTCH INFECTION AND GRAIN YIELD AT WONGAN HILLS (79WH16) IN EARLY PLANTING

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Disease Score</th>
<th>Grain Yield kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rovral - Alternate Week</td>
<td>0.000</td>
<td>6.65</td>
</tr>
<tr>
<td>4  - Week 4</td>
<td>0.028</td>
<td>6.25</td>
</tr>
<tr>
<td>6  - 6</td>
<td>0.065</td>
<td>7.10</td>
</tr>
<tr>
<td>10 - 10</td>
<td>0.083</td>
<td>5.90</td>
</tr>
<tr>
<td>12 - 12</td>
<td>0.028</td>
<td>6.10</td>
</tr>
<tr>
<td>Control</td>
<td>0.000</td>
<td>7.30</td>
</tr>
<tr>
<td>Mean</td>
<td>0.034</td>
<td>6.55</td>
</tr>
<tr>
<td>Yield kg/ha</td>
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<td>1819</td>
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8. **NET BLOTCH : GENOTYPE X FUNGICIDE X DATE OF PLANTING STUDIES**

**OBJECTIVES**

A pilot study to evaluate differences in field reaction of barley genotype to net blotch and associated yield variation, with a view to evolve field technique to evaluate advanced breeding material for net blotch resistance.

**EXPERIMENTAL**

Split plot arrangement in completely randomized block design as follows :

- **Main Plots**: Sprays with Rovral every two weeks vs No fungicide; Sub Plots: Early vs Late planting; Sub-Sub Plots - 10 genotypes at Wongan Hills and 11 at Badgingarra.

Plot size 1.25 x 5m with wheat buffer plot of similar dimensions on either side.

Location: Research Stations, Wongan Hills (79WH18) and Badgingarra (79BA25).

**RESULTS**

See Tables 8.1 and 8.2.

**COMMENTS**

1. Levels of infection at Wongan Hills were very low. However three genotypes in early planting and two genotypes in late planting exhibited significant differences in infection between fungicide and no fungicide treatments. Differences in grain yield were not significant.

2. At Badgingarra levels of infection were high and four genotypes in early planting showed significant differences ($P<0.001$) in infection between fungicide and no fungicide treatments. There were corresponding differences in grain yield. However differences in yield were not statistically significant like all other differences in yield. Only one genotype in late planting showed significantly increased infection in no fungicide treatment, but yield difference was negligible. Correlation between yield and net blotch was negative and significant ($-0.2245^*$) but regression of yield on net blotch was not significant. Correlation between net blotch infection and 100 seed weight was not significant.
3. Of special interest is a breeding line 74–0012 from the University of Western Australia's programme which is Dampier 4 x C.I. 9819. Its average yield in 79BA25 is comparable to Dampier but its resistance to net blotch may give it advantage over Dampier in conditions of heavy net blotch infection.
TABLE 8.1: 79WH18: DISEASE SCORE AND GRAIN YIELD AT WONGAN HILLS

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Disease Score %</th>
<th>Grain Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
</tr>
<tr>
<td></td>
<td>Fungicide</td>
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<tr>
<td>&quot;217/51</td>
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</tr>
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<td>0.000</td>
</tr>
<tr>
<td>C.I. 2330</td>
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<td>Beecer</td>
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<td>0.825</td>
</tr>
<tr>
<td>Dampier</td>
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<td>0.180</td>
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<tr>
<td>Clipper</td>
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<td>0.000</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significance of difference fungicide - no fungicide
### TABLE 8.2: 79BA25: DISEASE SCORE AND GRAIN YIELD AT BADGINGARRA

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Disease Score %</th>
<th>Grain Yield (g)</th>
<th>Mean</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fungicide</td>
<td>No Fungicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P*</td>
<td>No Fungicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early Planting</td>
<td>Late Planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fungicide</td>
<td>No Fungicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>No Fungicide</td>
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</tr>
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<td>1435</td>
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<td>Beecher</td>
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</tr>
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</tr>
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<td></td>
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<td>1130</td>
</tr>
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<td>1459</td>
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* Significance of difference fungicide - no fungicide
9. **POWDERY MILDEW: STUDIES IN GENOTYPE X FUNGICIDE**

**OBJECTIVES**

(i) To study resistance of isogenic lines and other genotypes of potential experimental value to powdery mildew;

(ii) To assess potential yield losses; and

(iii) To multiply seeds.

**EXPERIMENTAL**

Split plot arrangement in completely randomized block design with two replications as follows:

- **Main Plots**: Bi-weekly sprays with Milstem vs No fungicide;
- **Sub Plots**: Ten genotypes including isogenic lines designated with C.I. Nos.
- **Plot size**: 1.25 x 5m with wheat buffers of same dimensions.
- **Location**: Research Station, Badgingarra (79BA26).

**RESULTS**

See Table 9.1.

**COMMENTS**

1. Level of powdery mildew infection was very low, and no significant differences in scald infection were found either due to fungicide or due to genotype.

2. There were however significant differences in grain yield due to genotype and genotype x fungicide interactions. SADAF 39/89 gave significantly lower yield in absence of fungicide but there were no corresponding differences in mildew infection levels. Dampier on the other hand yielded significantly lower under fungicide treatment which may be partly due to higher net blotch and scald infection in fungicide treatment.

3. Clipper continued to display relative resistance. SADAF lines are back-cross lines with apparently 99% Clipper background. In view of their susceptibility to powdery mildew, they are potentially useful as isogenic lines when used in conjunction with Clipper.
TABLE 9.1 : 79BA26 : DISEASE SCORE AND GRAIN YIELD
IN POWDERY MILDEW GENOTYPE X FUNGICIDE TRIAL

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Gene for P. Mildew Resistance</th>
<th>Disease Score</th>
<th>Grain Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fungicide</td>
<td>No Fungicide</td>
</tr>
<tr>
<td>SADAF 39/89</td>
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</tr>
<tr>
<td>&quot; 56/51</td>
<td>-</td>
<td>1.29</td>
<td>9.72</td>
</tr>
<tr>
<td>&quot; 70/69</td>
<td>-</td>
<td>1.31</td>
<td>4.02</td>
</tr>
<tr>
<td>C.I. 16137</td>
<td>Mla</td>
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<td>0.00</td>
</tr>
<tr>
<td>&quot; 16141</td>
<td>Mlh</td>
<td>0.00</td>
<td>0.03</td>
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<td>&quot; 16142</td>
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<td>0.47</td>
<td>1.82</td>
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<tr>
<td>&quot; 16149</td>
<td>Mla 10</td>
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<tr>
<td>&quot; 16150</td>
<td>-</td>
<td>0.81</td>
<td>1.94</td>
</tr>
<tr>
<td>Dampier</td>
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<td>0.00</td>
<td>1.07</td>
</tr>
<tr>
<td>Clipper</td>
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<td>0.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>1.19a</td>
<td>2.53a</td>
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<td>Yield Kg/Ha</td>
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