

MORLEY RESEARCH CENTRE

Foliar fungicide programmes on durum wheat

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Summary

Fungicide treatments were evaluated as two or three-spray programmes on the durum wheat variety Tetradur, drilled on 24 November 2000 on the loamy sand soil at Colney, Norwich. All plots (except the untreated) received Alto 240 + Fortress (0.2 + 0.1 l/ha) on 10 May (GS 32). Treatments of Opus (alone or in mixture with Orka and Twist) and Landmark were then applied on 23 May (GS 39-41), with the three-spray programmes also being treated with either Amistar (0.5 l/ha) or Landmark (0.5 l/ha) on 12 June (GS 59-61). When the final treatments were applied on 12 June, *Septoria tritici* was recorded as a trace and 0.4% of the area of leaves 3 and 4 respectively. When assessed on 11 July (GS 73-75), *Septoria tritici* was affecting 4.8% of the area of leaf 1 on untreated crop. All the fungicide programmes significantly reduced infection when compared with the untreated crop, but they had no significant effect on the retention of green leaf area on leaves 1 and 2. Where no fungicide was applied, the crop produced a yield of 5.92 t/ha, with a specific weight of 75.3 kg/hl and a 1000 grain weight of 50.3 g. There were no significant effects of fungicide treatment on grain yield or specific weight, but grain size was significantly increased where either Amistar or Landmark was applied at full ear emergence.

Object

To examine the effect of a range of foliar fungicide programmes on durum wheat

Method

| | |
|---------------------------------|---|
| <i>Site</i> | New Found Farm, Colney, Norwich |
| <i>Soil type and series</i> | Loamy sand |
| <i>Variety</i> | Tetradur |
| <i>Treatments</i> | Details of treatments are given in Tables 1 & 2 |
| <i>Sowing date</i> | 24 November 2000 |
| <i>Husbandry</i> | The crop followed potatoes, all applications as farm crop except fungicide, field details as outlined in Appendix |
| <i>Trial design</i> | Randomised block with four replicates |
| <i>Analysis</i> | ANOVA with LSD's quoted at P = 0.05 |
| <i>Plot size</i> | 12 m x 2.1 m with buffers |
| <i>Application</i> | All plot (except the untreated) received Alto 240 + Fortress (0.2 + 0.1 l/ha) on 10 May (GS 32). Treatments (see Tables 1 & 2) were applied on 23 May (GS 39-41) and 12 June (GS 59-61) in 200 l/ha water as a medium spray using F110-03 nozzles |
| <i>Experiment diary</i> | See Appendix |
| <i>Deviations from protocol</i> | <ul style="list-style-type: none"> • Grain protein content and hagberg were not determined |

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Results

Table 1. Grain yield (t/ha at 85% dm)

| Fungicide (l/ha) 23 May GS 39-41 | 12 June GS 59-61 | | | Mean |
|---------------------------------------|------------------|---------------|----------------|------|
| | Untreated | Amistar (0.5) | Landmark (0.5) | |
| Untreated | - | - | - | 5.92 |
| Opus (0.5) | 5.98 | 6.14 | 6.02 | 6.05 |
| Opus + Orka (0.5 + 0.5) | 6.08 | 6.13 | 6.06 | 6.09 |
| Landmark (0.5) | 5.97 | 6.26 | 6.20 | 6.14 |
| Opus + Twist (0.5 + 1.0) | 6.09 | 6.25 | 6.10 | 6.15 |
| Opus + Twist + Orka (0.5 + 1.0 + 0.5) | 6.16 | 6.26 | 6.17 | 6.20 |
| LSD | | NS | | NS |
| Mean | 6.06 | 6.21 | 6.11 | |
| LSD | | NS | | |

SE per plot (45 df) = ± 0.218 or 3.6 CV (%)

NB all plots (except the untreated) received Alto 240 + Fortress (0.2 + 0.1 l/ha) on 10 May (GS 32)

Table 2. Active ingredients of commercial products used

| Product | Active ingredients (ai) | g ai/l or % w/w | Formulation |
|----------|---------------------------------|-----------------|-------------|
| Alto 240 | cyproconazole | 240 | EC |
| Amistar | azoxystrobin | 250 | SC |
| Fortress | quinoxifen | 500 | SC |
| Landmark | epoxiconazole + kresoxim-methyl | 125 + 125 | SC |
| Opus | epoxiconazole | 125 | SC |
| Orka | fenpropimorph + quinoxifen | 250 + 66.7 | EW |
| Twist | trifloxystrobin | 125 | EC |

- The crop followed potatoes and was drilled on 24 November 2000.
- Establishment was satisfactory, with 251 plants/m² recorded when counts were made on 25 January 2001.
- When the fungicides were applied on 12 June (GS 59-61), *Septoria tritici* was recorded as a trace and 0.4% of the area of leaves 3 and 4 respectively (leaf 1 = flag) on untreated crop.
- When assessed on 11 July (GS 73-75), *Septoria tritici* was affecting 4.8% of the area of leaf 1 on untreated crop (Table A2). All the fungicide programmes significantly reduced infection when compared with the untreated crop, but they had no effect on the retention of green leaf area on leaves 1 and 2 (Table A2).
- Where no fungicide was applied, the crop produced a yield of 5.92 t/ha (Tables 1 and A3). There were no significant effects of fungicide treatment on grain yield.

- Where no fungicide was applied, the crop had a specific weight of 75.3 kg/hl, with a 1000 grain weight of 50.3 g (Table A3). Whilst fungicide treatment had no significant effect on specific weight, mean grain size was significantly increased where either Amistar or Landmark was applied at full ear emergence.

Further details

Other experiment details and results are presented in the appendix.

Field details

Applications to crop

Experiment diary

Method

Results

Table A1 Order of treatments in tables of results

Table A2 Disease and green leaf area (% leaf area)

Table A3 Grain yield (t/ha), specific weight (kg/hl) and 1000 grain weight

Field details

| | | | | |
|-----------------------------|-------------------------------------|----------------------|----|----|
| Site | New Found Farm, Colney, Norwich | | | |
| Field reference | Block 2 | | | |
| Crop | Durum wheat | | | |
| Variety | Tetradur | | | |
| Previous crop | 2000 Potatoes 1999 Winter barley | | | |
| Soil type and series | Loamy sand | | | |
| Soil analysis | pH | P | K | Mg |
| July 2001 | 7.7 | 2+ | 0- | 0+ |
| Seed rate | 450 seeds/m ² | | | |
| Date sown | 24 November 2000 | | | |
| Cultivations | 23 November 2000 | Ploughed and pressed | | |

Applications to crop

Precise treatments remain confidential but they are held on file. Appropriate treatments were applied to give a good commercial level of control of weeds, pests and crop growth and of crop nutrition.

Experiment diary

| Date | GS | Treatments applied or action |
|------------------|-------|--|
| 24 November 2000 | - | Trial drilled using Oyjord plot drill |
| 25 January 2001 | 13 | Plant count (251/m ²) |
| 10 May | 32 | Alto 240 + Fortress (0.2 + 0.1 l/ha) applied to all plots except the untreated. Weather conditions sunny and hot (24°C) |
| 23 May | 39-41 | 1 st fungicide application as per treatment list. Weather conditions sunny and hot (24°C) |
| 12 June | 59-61 | 2 nd fungicide application as per treatment list. Weather conditions cloudy and warm (21°C) Assessment of disease and green leaf area |
| 11 July | 73-75 | Assessment of disease and green leaf area |
| 14 August | 92 | Trial harvested using Sampo 2010 "W " plot combine |

Spray and assessment methods for cereal trials

This is an abbreviated version of the standard operating procedures used at Morley Research Centre.

Plot layout

Plots were sown at 450 seeds/m² with an Oyjord drill. The drilled plots were 12 m long and 1.56 m wide from outside row to outside row (14 rows at 12.0 cm spacing). Plots were separated by a buffer of the same size with a 54 cm gap between successive plots and buffers. This gave an effective plot width of 2.10 m, which was used for harvest yield calculations. Treatments were applied to the plot and to half of the buffer at each side. For harvest purposes, plot length was reduced to 9.0 m.

Overall treatments

Overall treatments such as fertiliser, insecticides, herbicides and growth regulators were applied across all plots with farm machinery using wheelings which were 24 m apart.

Spraying details

Treatments were applied using a CO₂ powered backpack sprayer, utilising 'Cornelius' vessels and a 4 m boom (eight nozzles at 0.5 m spacings) with Lurmark F110-03 nozzles at 2 bar pressure, to give 200 l/ha spray volume at 1.6 m/s forward speed.

Agronomic factors

Overall plant population was determined by making 50 counts of a 30.5 x 30.5 cm quadrat at random across the site.

Foliar disease and green leaf area

Foliar disease of a particular leaf or leaf layer was determined by the following method. A standard (based on the appropriate key from the ADAS manual of disease assessment keys,

1976) was agreed between two experienced assessors and plots were assessed by walking along the gap between the harvest area and the buffer, examining the plot from both sides. The crop was examined at intervals and an appropriate disease level was agreed at the end of each plot.

The green area of a particular leaf or leaf layer was determined by two experienced assessors walking along the gap between the harvest area and the buffer, examining the plot from both sides. The crop was examined at intervals and an appropriate green leaf area was agreed at the end of each plot.

Harvest details

Plots were harvested using a Sampo 2010 combine which was modified for plot work and used electronic weighing (Harvest Master HM-400 with Grain Gauge). Trials were harvested by replicate.

Post harvest determinations

Moisture content was determined by taking a 200 g subsample, oven drying for 40 hours at 100-102° C, and weighing at ambient temperature.

The grain samples were pre-cleaned using a Rational sample cleaner to remove any chaff or straw before further assessments (specific weight or 1000 grain weight) were carried out.

Specific weight was determined using a Farm-Tec Easi-Lab chondrometer and electronic balance. A minimum of two samples were tested from each plot, with a tolerance of 2.0 g required between samples.

1000 grain weight was determined by counting 200 grains from a well mixed sample and weighing on an electronic balance. A minimum of two samples were tested from each plot with a tolerance of 0.2 g required between samples.

Results

Table A1 Order of treatments in tables of results

| Fungicide (l/ha) 23 May (GS 39-41) | 12 June (GS 59-61) | | | Mean |
|---------------------------------------|--------------------|---------------|----------------|------|
| | Untreated | Amistar (0.5) | Landmark (0.5) | |
| Untreated | - | - | - | 16 |
| Opus (0.5) | 1 | 2 | 3 | |
| Opus + Orka (0.5 + 0.5) | 4 | 5 | 6 | |
| Landmark (0.5) | 7 | 8 | 9 | |
| Opus + Twist (0.5 + 1.0) | 10 | 11 | 12 | |
| Opus + Twist + Orka (0.5 + 1.0 + 0.5) | 13 | 14 | 15 | |

NB all plots (except the untreated) received Alto 240 + Fortress (0.2 + 0.1 l/ha) on 10 May (GS 32)

Tables of results

Table A2 *Disease and green leaf area (% leaf area)*

| Treatments | GLA | Septoria | GLA | Septoria | GLA | GLA |
|-----------------------|------------|------------|------------|------------|------------|------------|
| - | Leaf 3 | Leaf 4 | Leaf 4 | Leaf 1 | Leaf 1 | Leaf 2 |
| Unit | % | % | % | % | % | % |
| Date | 12/06/2001 | 12/06/2001 | 12/06/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 |
| 1 | 98.8 | 0.18 | 50.0 | 1.6 | 77.3 | 45.8 |
| 2 | 98.5 | 0.23 | 43.8 | 1.3 | 78.0 | 47.3 |
| 3 | 99.0 | 0.23 | 47.5 | 1.5 | 74.3 | 42.3 |
| 4 | 98.8 | 0.20 | 48.8 | 1.8 | 75.0 | 41.8 |
| 5 | 95.3 | 0.32 | 41.3 | 1.2 | 77.0 | 47.8 |
| 6 | 99.0 | 0.23 | 33.8 | 1.5 | 73.0 | 39.3 |
| 7 | 95.3 | 0.20 | 45.0 | 2.4 | 75.3 | 42.3 |
| 8 | 99.0 | 0.25 | 48.8 | 1.2 | 76.3 | 48.3 |
| 9 | 99.0 | 0.15 | 41.3 | 1.1 | 78.3 | 51.3 |
| 10 | 96.8 | 0.20 | 55.0 | 1.4 | 75.8 | 45.8 |
| 11 | 95.0 | 0.30 | 47.5 | 1.4 | 75.5 | 41.8 |
| 12 | 98.8 | 0.25 | 52.5 | 1.8 | 73.5 | 42.0 |
| 13 | 98.4 | 0.60 | 45.0 | 2.5 | 74.0 | 43.3 |
| 14 | 98.8 | 0.33 | 50.0 | 1.7 | 74.8 | 43.5 |
| 15 | 98.3 | 0.30 | 48.8 | 1.7 | 74.3 | 46.3 |
| 16 | 94.3 | 0.40 | 45.0 | 4.8 | 71.5 | 34.5 |
| LSD (P=0.05) | NS | NS | NS | 1.04 | NS | NS |
| SE per plot (45 df) ± | 3.98 | 0.235 | 9.82 | 0.73 | 4.20 | 9.04 |
| CV (%) | 4.1 | 86.5 | 21.1 | 40.7 | 5.6 | 20.6 |

Table A3 *Grain yield (t/ha at 85% dm), specific weight (kg/hl at 85% dm) and 1000 grain weight (g at 85% dm)*

| Treatments - Unit Date | Grain yield at 85% dm t/ha 14/08/2001 | Specific weight at 85% dm kg/hl | TGW at 85% dm g |
|---------------------------------|--|---------------------------------------|-----------------------|
| 1 | 5.98 | 75.7 | 49.1 |
| 2 | 6.14 | 75.6 | 51.6 |
| 3 | 6.02 | 75.9 | 50.9 |
| 4 | 6.08 | 75.2 | 49.2 |
| 5 | 6.13 | 75.9 | 51.4 |
| 6 | 6.06 | 76.0 | 51.1 |
| 7 | 5.97 | 75.9 | 49.7 |
| 8 | 6.26 | 75.2 | 50.9 |
| 9 | 6.20 | 75.9 | 51.5 |
| 10 | 6.09 | 75.8 | 49.9 |
| 11 | 6.25 | 76.2 | 51.4 |
| 12 | 6.10 | 76.2 | 50.9 |
| 13 | 6.16 | 75.3 | 49.9 |
| 14 | 6.26 | 75.9 | 50.4 |
| 15 | 6.17 | 75.7 | 50.5 |
| 16 | 5.92 | 75.3 | 50.3 |
| LSD (P=0.05) | NS | NS | 1.23 |
| SE per plot (45 df) ± | 0.218 | 0.53 | 0.86 |
| CV (%) | 3.6 | 0.7 | 1.7 |