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AGRONOMY + RESEARCH

# MANAGEMENT STRATEGIES FOR WHEAT POWDERY MILDEW IN SOUTHERN NSW

## *VALIDATION AND EXTENSION*

*This project is a GRDC Investment and is a National Grower Network (NGN) initiative. Ag Grow Agronomy and Research is working in collaboration with Field Applied Research (FAR) Australia for this project.*

FAR AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

INDEPENDENT AGRONOMY ADVICE + CUTTING EDGE RESEARCH

# *Demonstrating cost effective fungicide resistance management strategies for WPM*

## KEY POINTS

- **2023 was a season which did not favour the development of powdery mildew. Very little powdery mildew was found in the trial, with higher levels of other diseases such as stripe rust and septoria tritici blotch lower in the canopy recorded.**
- **The fungicide product trial showed, in the presence of disease (stripe rust and septoria), that it is important to have a spray program in place, regardless of product, with the Nil treatment yielding significantly lower than all other treatments in the trial.**
- **Variety choice and disease resistance is important. Scepter was the most susceptible variety to stripe rust and had more stripe rust than both Brumby and Sunmaster. Grain yield of Sunmaster did not differ between any of the fungicide treatments including the Nil, whereas having no fungicides applied to Scepter and Brumby impacted grain yield.**
- **A planned approach to disease management is important, particularly when growing more susceptible varieties.**

## BACKGROUND

Wheat powdery mildew (WPM) can cause up to 25% yield loss in Australia with commonly grown varieties possessing poor resistance, ranging from susceptible/very susceptible (SVS) to very susceptible (VS). In the Northern region WPM is particularly problematic in the western lower rainfall areas of NSW in years of higher than average rainfall and irrigated paddocks, though is found throughout the wheat growing regions of NSW.

In the Northern region, shifts in fungicide sensitivity and resistance to both Group 3 (DMI) and Group 11 (QoI) fungicides have been detected in WPM in paddocks across SE, SW, NE and NW NSW. Detection of fungicide resistance indicates potential inefficacy of these fungicide groups when applied in crop. The alternative fungicide Group 7 (SDHI) has limited registered products for WPM. Resistance management strategies are necessary to prevent loss or reduced efficacy of the fungicide options available to manage this disease.

This 2-year project is a GRDC Investment and is a National Grower Network (NGN) initiative. For this project Ag Grow Agronomy and Research is working in collaboration with Field Applied Research (FAR) Australia, with sites at Hillston (managed by Ag Grow) and Balldale (managed by FAR Australia). These research sites are both considered high risk for wheat powdery mildew and will investigate methods to manage wheat powdery mildew and minimise and/or reduce fungicide resistance in a cost-effective strategy.

More specifically the trials will investigate the use of different fungicide products and genetic resistance to control wheat powdery mildew and to reduce fungicide resistance.

This trial report focuses on the 2023 results from the Hillston site.

## 2023 Seasonal Conditions:

The 2022 season was generally wet, so coming into the 2023 season there was a full profile of moisture. There was little rain the second half of April and most of May drying out the top profile, table 1. Due to the conditions at sowing the trials were sown dry and watered up.

Good conditions in June and early July allowed crops to get away. Dry and frosty conditions persisted in August and early September, with consecutive frost events occurring on 9th and 10th September. Rain early October was timely, following the warm weather in late September, with the trials receiving 2 spring irrigations. The season finished with hot and dry conditions.

Table 1: 2023 Rainfall and Growing Season Rainfall (GSR) for Hillston, compared to the long-term rainfall.

| MONTH | Hillston Airport 2023 | Hillston Airport Long Term (1881 to 2023) |
|---|---|---|
| **January** | 51.8 | 31.6 |
| **February** | 0 | 27 |
| **March** | 40.6 | 33.5 |
| **April** | 24 | 27.8 |
| **May** | 8.2 | 31.9 |
| **June** | 50.8 | 35.4 |
| **July** | 28.2 | 30.5 |
| **August** | 17.8 | 30.8 |
| **September** | 1.6 | 28.7 |
| **October** | 25.6 | 36.5 |
| **November** | 72.6 | 30.3 |
| **December** | 43 | 30.1 |
| ***TOTAL*** | ***364.2*** | ***374.4*** |
| *GSR (April - Oct)* | *156.2* | *221.6* |

## TRIAL DETAILS

The trials were established at Graeme Horneman's "Wilga Glen" Hillston (approximately 125 km NW of Griffith).

Soil tests before sowing showed the site had a pH ($CaCl_2$) 7.9, Total N (0-60cm) 172 kg N/ha and Colwell P 32ppm. 250 kg/ha urea was pre-drilled and a further 300 kg/ha urea was topdressed in August. The trials were sown following canola in 2022.

Both trials were statistically designed and fully replicated four times. They were sown with a Morris Contour Drill plot seeder, with 25cm row spacings. Plot sizes were 12m by 1.75m (21$m^2$).

They were sown shallow on 16th May 2023, with 150 kg/ha DAP, and watered up. The site received 2 spring irrigations, a total of 4 ML/ha including watering up. Weeds and pests were adequately controlled. The trial was harvested 7th December 2023.

### Trial 1 Fungicide Product Trial

This trial was set up to demonstrate and validate cost effective fungicide resistance management strategies for wheat powdery mildew. The trial consisted of 10 post emergent fungicide product combinations, applied twice at full label rates at stem elongation (GS31) and flag leaf emergence (GS39), table 2.

Fungicide treatments were applied with a handheld Brolga lightweight offset trial spray boom, with a spray volume of 100L/ha. All plots were sown to the wheat variety Scepter at a seed rate of 250 seeds/$m^2$, targeting a plant population of 200 plants/$m^2$.

The first fungicide treatment was applied on 11th August 2023 at growth stage GS31. No disease was observed at time of spraying. The environmental conditions at the time of application (1pm) were 15.6°C temperature, 49% relative humidity, and wind speed 9km/hr.

The second fungicide application was applied on 13th September 2023 at growth stage GS39 to awn peep. There were very few pustules of WPM, with some septoria and stripe rust present. The environmental conditions at the time of application (2pm) were 25.2°C temperature, 26% relative humidity, and wind speed 13km/hr.

Table 2: Treatment list for Hillston Product Trial 2023.

| Trt No. | Treatment | Product/s | Product rate /ha | Active g/L | Active rate g /ha |
|---|---|---|---|---|---|
| 1 | Nil Control | Nil | --- | --- | |
| 2 | Vivando + Opus 125 | Vivando + Opus125 | 300ml/ha 500ml/ha | Metrafenone 500g/L Epoxiconazole 125g/L | 150g/ha 62.5g/ha |
| 3 | Talendo + Opus 125 | Toledo + Opus125 | 250ml/ha 500ml/ha | Proquinazid 200g/L Epoxiconazole 125g/L | 50g/ha 62.5g/ha |
| 4 | Legend + Opus 125 | Legend + Opus125 | 300ml/ha 500ml/ha | Quinoxyfen 250g/L Epoxiconazole 125g/L | 75g/ha 62.5g/ha |
| 5 | Orius | Orius | 290ml/ha | Tebuconazole 430g/L | 124.7g/ha |
| 6 | Proviso | Proviso | 250ml/ha | Prothioconazole 250g/L | 62.5g/ha |
| 7 | Opus125 | Opus125 | 500ml/ha | Epoxiconazole 125g/L | 62.5g/ha |
| 8 | Radial | Radial | 840ml/ha | Epoxiconazole 75g/L Azoxystrobin 75g/L | 63g/ha 63g/ha |
| 9 | Prosaro | Prosaro | 300ml/ha | Prothioconazole 210g/L Tebuconazole 210g/L | 63g/ha 63g/ha |
| 10 | Proviso + Opus + Orius | Proviso + Opus + Orius | 250ml/ha 500ml/ha 145ml/ha | Prothioconazole 250g/L Epoxiconazole 125g/L Tebuconazole 430g/L | 62.5g/ha 62.5g/ha 62.4g/ha |

## Trial 2 Germplasm x Fungicide Strategy Trial

This trial was set up to validate the effectiveness of varietal resistance as part of an Integrated Disease Management strategy. It will also determine where the use of specific mildewcides fit into a disease management strategy.

The trial consisted of 3 cultivars of differing resistance levels sown at a seed rate of 200 seeds/ $m^2$, targeting a plant population of 150 plants/$m^2$, and 5 fungicide strategies, table 3.

Table 3: Variety and fungicide strategies for Hillston trial 2023.

**Factor 1 – Germplasm**

| # | Cultivar | WPM Resistance | SR Resistance | STB Resistance |
|---|---|---|---|---|
| 1 | Scepter | SVS | MSS | S |
| 2 | Brumby | R | MS | S |
| 3 | Sunmaster | SVS | MRMS | S |

**Factor 2 – Fungicide strategy**

| | |
|---|---|
| 1. | Nil Control |
| 2. | Flutriafol + GS39 |
| 3. | Flutriafol + GS39 (Include mildewcide) |
| 4. | GS31 + GS39 + GS59 |
| 5. | GS31 + GS39 + GS59 (Include 2 mildewcides) |

Fungicide treatments were also applied with a handheld Brolga lightweight offset trial spray boom, with a spray volume of 100L/ha.

The first two fungicide application timings were as per trial 1, with the third fungicide application applied on 9th October 2023 at mid to late flowering.

There were very few pustules of WPM, with a lot of stripe rust present and septoria in the lower canopy at the third timing. The environmental conditions at the time of application (2pm) were 24.6°C temperature, 28% relative humidity, and wind speed 17km/hr.

| # | Sowing | GS31 | GS39 | GS59 |
|---|---|---|---|---|
| 1 | Nil | Nil | Nil | Nil |
| 2 | Flutriafol | Nil | Amistar Xtra 800ml/ha | Nil |
| 3 | Flutriafol | Nil | Amistar Xtra 800ml/ha + Legend 300ml/ha | Nil |
| 4 | Nil | Prosaro 300ml/ha | Amistar Xtra 800ml/ha | Opus125 500ml/ha |
| 5 | Nil | Prosaro 300ml/ha + Legend 300ml/ha | Amistar Xtra 800ml/ha | Opus125 500ml/ha + Vivando 300ml/ha |

## RESULTS AND DISCUSSION

Establishment, disease, grain yield, and quality (protein, screenings and test weight) were assessed on both trials, and statistically analysed using the most appropriate form of analysis.

### Establishment:

Establishment was assessed on both trials on 21st June 2023, at the 3-leaf growth stage. Establishment was scored (visual scores) on individual plots from 0-9, with 0 indicating poor establishment and 9 indicating very even establishment.

Both trials established well, with an average establishment score of 8.3 for the product trial and 8.5 for the variety by management strategy trial, figure 1.

Figure 1: Establishment for product trial (top) and variety by management strategy trial (bottom), May 2023.

### Disease Assessment:

For both trials pathogen levels were assessed on specific leaf layers (top 4 leaves) on 10 main stems per plot, with disease recorded as a percentage of leaf area infected per leaf layer. Diseases that were recorded were Wheat Powdery Mildew (WPM), Stripe Rust (YR) and Septoria Tritici Blotch (STB).

Each trial was assessed 3 times including:

1. Timing of application 1 (GS31) – For trial 1 this was for the control treatments only, to give an indication of disease progression; and for trial 2 this was for fungicide treatments 1&2 only, for all 3 cultivars.
2. Timing of application 2 (GS39) – For trial 1 this was for all plots; and for trial 2 this was for fungicide treatments 1,2,4&5 in all 3 cultivars.
3. 21 days post application 2 (GS65-71) – All plots in both trials.

For both trials no disease was observed at the first assessment timing and very minimal disease was observed at assessment timing 2. As a result, no statistical analysis was carried out on the first 2 assessments. In both trials no WPM was recorded, so disease assessment reflects the levels of stripe rust and septoria found in each treatment and in each trial.

For assessment 3, disease was assessed on the top 4 leaves. In both trials disease levels were highest in leaf 4. As there was a large portion of the leaf area of leaf 4 that was dead, and in most cases the whole leaf had been killed by disease, it was hard to accurately portion which disease was the cause. As such leaf 4 was not analysed for disease.

There was very little disease observed in assessments 1 and 2, with assessment 3 showing higher levels of stripe rust and septoria in the lower canopy, figure 2.

Figure 2: Assessment 3, nil fungicide (left) v fungicide treatment (right), October 2023.

## Trial 1 Fungicide Product Trial

All fungicide treatments were effective in controlling both stripe rust and septoria in the top 3 leaves, with the Nil treatment having significantly higher levels of disease than all other treatments, tables 4 and 5.

As Septoria was mainly present in the lower canopy, there was not enough disease data for leaf 1 for Septoria, as such leaf 1 was not analysed for Septoria.

Table 4: Assessment 3 – Level of Stripe Rust recorded in trial on top 3 leaves, October 2023.

| Trt No. | TREATMENT | Leaf 1 Stripe Rust (%) | *Sig level* | Leaf 2 Stripe Rust (%) | *Sig level* | Leaf 3 Stripe Rust (%) | *Sig level* |
|---|---|---|---|---|---|---|---|
| 1 | Nil Control | 46.25 | *a* | 53.50 | *a* | 46.72 | *a* |
| 2 | Vivando + Opus 125 | 0.02 | *b* | 0.36 | *b* | 0.03 | *b* |
| 3 | Talendo + Opus 125 | 0.02 | *b* | 0.08 | *b* | 0.09 | *b* |
| 4 | Legend + Opus 125 | 0.08 | *b* | 0.38 | *b* | 0.01 | *b* |
| 5 | Orius | 0.08 | *b* | 0.23 | *b* | 0.19 | *b* |
| 6 | Proviso | 0.26 | *b* | 0.50 | *b* | 0.30 | *b* |
| 7 | Opus125 | 0.03 | *b* | 0.31 | *b* | 0.06 | *b* |
| 8 | Radial | 0.03 | *b* | 0.21 | *b* | 0.00 | *b* |
| 9 | Prosaro | 0.04 | *b* | 0.21 | *b* | 0.07 | *b* |
| 10 | Proviso + Opus + Orius | 0.12 | *b* | 0.17 | *b* | 0.03 | *b* |
| | ***Mean*** | ***4.69*** | | ***5.60*** | | ***4.75*** | |
| | ***LSD(p=0.05)*** | ***2.3*** | | ***2.698*** | | ***3.912*** | |

*Note: Means followed by same letter do not significantly differ*

Table 5: Assessment 3 – Level of Septoria Tritici Blotch recorded in trial on leaves 2 and 3, October 2023.

| Trt No. | TREATMENT | Leaf 2 Septoria (%) | *Sig Level* | Leaf 3 Septoria (%) | *Sig Level* |
|---|---|---|---|---|---|
| 1 | Nil Control | 14.34 | *a* | 19.09 | *a* |
| 2 | Vivando + Opus 125 | 0.46 | *b* | 0.62 | *b* |
| 3 | Talendo + Opus 125 | 0.41 | *b* | 0.37 | *b* |
| 4 | Legend + Opus 125 | 0.33 | *b* | 0.31 | *b* |
| 5 | Orius | 0.6 | *b* | 1.03 | *b* |
| 6 | Proviso | 0.39 | *b* | 0.76 | *b* |
| 7 | Opus125 | 1.06 | *b* | 0.92 | *b* |
| 8 | Radial | 0.32 | *b* | 0.53 | *b* |
| 9 | Prosaro | 0.31 | *b* | 0.22 | *b* |
| 10 | Proviso + Opus + Orius | 0.41 | *b* | 0.4 | *b* |
| | ***Mean*** | ***1.86*** | | ***2.42*** | |
| | ***LSD(p=0.05)*** | ***1.805*** | | ***1.425*** | |

*Note: Means followed by same letter do not significantly differ*

## Trial 2 Germplasm x Fungicide Strategy Trial

Across varieties, all fungicide treatments were effective in controlling stripe rust and septoria, with the Nil treatment having significantly higher levels of disease than all other treatments, tables 6 and 7. Besides the Nil treatment, there was minimal disease in all other treatments, figure 3.

Varieties in the trial were chosen for their varying powdery mildew resistance. The varieties also varied in their resistance to stripe rust, with Scepter the most susceptible variety and having greater levels of disease than both Brumby and Sunmaster.

Table 6: Assessment 3 – Variety by fungicide treatment level of Stripe Rust recorded in top 3 leaves, October 2023.

| 3rd Assessment - Stripe Rust (%) leaf 1 | | VARIETY | | |
|---|---|---|---|---|
| Trt No. | Treatment | Brumby | Scepter | Sunmaster |
| 1 | Nil | 9.5 | 56.3 | 1.3 |
| 2 | Flut\|Nil\| Ami\|Nil | 0.0 | 0.5 | 0.0 |
| 3 | Flut\|Nil\| AmiLeg\|Nil | 0.2 | 0.2 | 0.0 |
| 4 | Nil\|Pros\|AMI\|Opus | 0.0 | 0.2 | 0.0 |
| 5 | Nil\|Pros\| AMI\|OpusViv | 0.0 | 0.2 | 0.0 |
| | ***Max LSD(p=0.05)*** | ***1.21*** | | |

| 3rd Assessment - Stripe Rust (%) leaf 2 | | VARIETY | | |
|---|---|---|---|---|
| Trt No. | Treatment | Brumby | Scepter | Sunmaster |
| 1 | Nil | 26.2 | 72.6 | 4.2 |
| 2 | Flut\|Nil\| Ami\|Nil | 0.3 | 1.5 | 0.1 |
| 3 | Flut\|Nil\| AmiLeg\|Nil | 1.4 | 0.5 | 0.2 |
| 4 | Nil\|Pros\|AMI\|Opus | 0.3 | 0.8 | 0.1 |
| 5 | Nil\|Pros\| AMI\|OpusViv | 0.1 | 0.5 | 0.2 |
| | ***Max LSD(p=0.05)*** | ***1.26*** | | |

| 3rd Assessment - Stripe Rust (%) leaf 3 | | VARIETY | | |
|---|---|---|---|---|
| Trt No. | Treatment | Brumby | Scepter | Sunmaster |
| 1 | Nil | 27.5 | 60.4 | 9.1 |
| 2 | Flut\|Nil\| Ami\|Nil | 0.7 | 2.0 | 0.2 |
| 3 | Flut\|Nil\| AmiLeg\|Nil | 3.2 | 0.8 | 0.5 |
| 4 | Nil\|Pros\|AMI\|Opus | 0.4 | 0.4 | 0.2 |
| 5 | Nil\|Pros\| AMI\|OpusViv | 0.1 | 0.6 | 0.1 |
| | ***Max LSD(p=0.05)*** | ***1.27*** | | |

As septoria was at higher levels lower in the canopy, there was not enough disease data to analyse leaf 1 and 2 for septoria, as such only leaf 3 data is presented below for septoria. All varieties are rated susceptible to septoria, with Brumby having the highest level of septoria out of the varieties in the untreated plots.

Table 7: Assessment 3 – Variety by fungicide treatment level of Septoria recorded in leaf 3, October 2023.

| 3rd Assessment - Septoria (%) leaf 3 | | VARIETY | | |
|---|---|---|---|---|
| Trt No | Treatment | Brumby | Scepter | Sunmaster |
| 1 | Nil | 6.5 | 2.2 | 1.2 |
| 2 | Flut\|Nil\| Ami\|Nil | 0.5 | 1.3 | 0.3 |
| 3 | Flut\|Nil\| AmiLeg\|Nil | 1.6 | 0.3 | 0.2 |
| 4 | Nil\|Pros\|AMI\|Opus | 0.1 | 0.3 | 0.2 |
| 5 | Nil\|Pros\| AMI\|OpusViv | 0.1 | 0.4 | 0.2 |
| | ***Max LSD(p=0.05)*** | ***1.46*** | | |

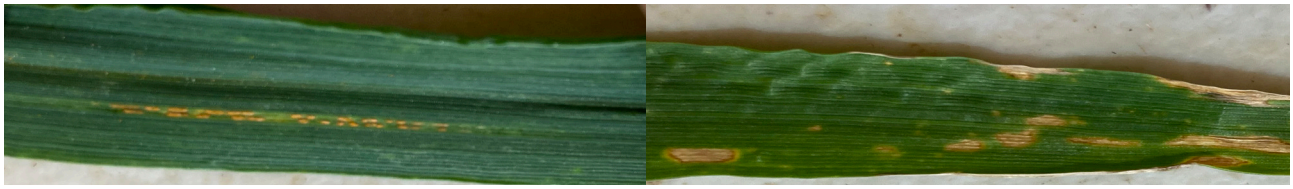


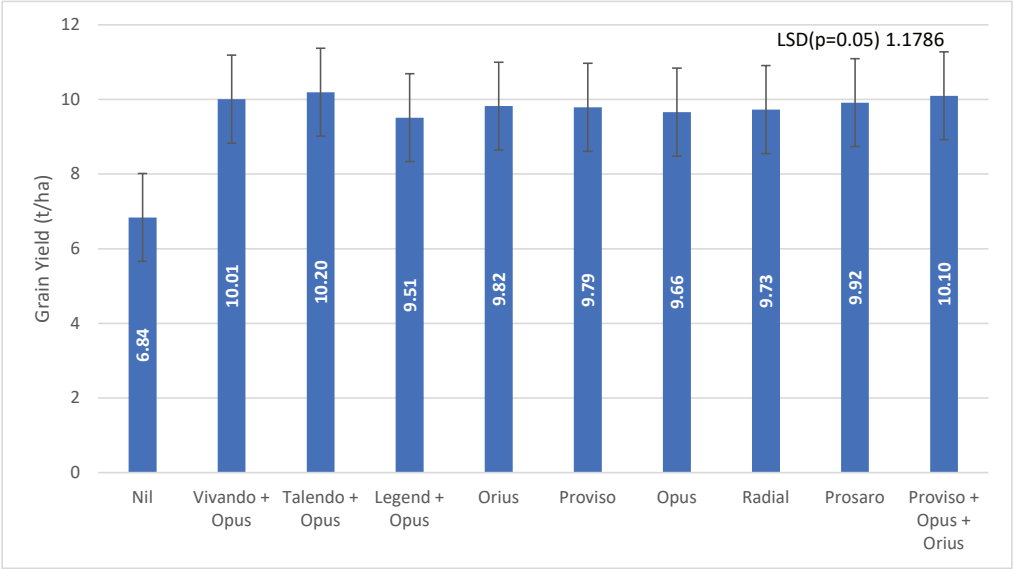
Figure 3: Disease level in the untreated Nil (left) compared to treated plot (right), October 2023.

## Grain Yield (Analysed using ASReml)

### Trial 1 Fungicide Product Trial

The average yield of the trial was 9.56 t/ha. Yields ranged from 6.84 t/ha for the Nil treatment, which was statistically lower than all other treatments, to 10.20 t/ha for Talendo + Opus, figure 4. There were no statistical difference between any of the fungicide products applied in the trial.

Figure 4: Average grain yield of fungicide product trial.



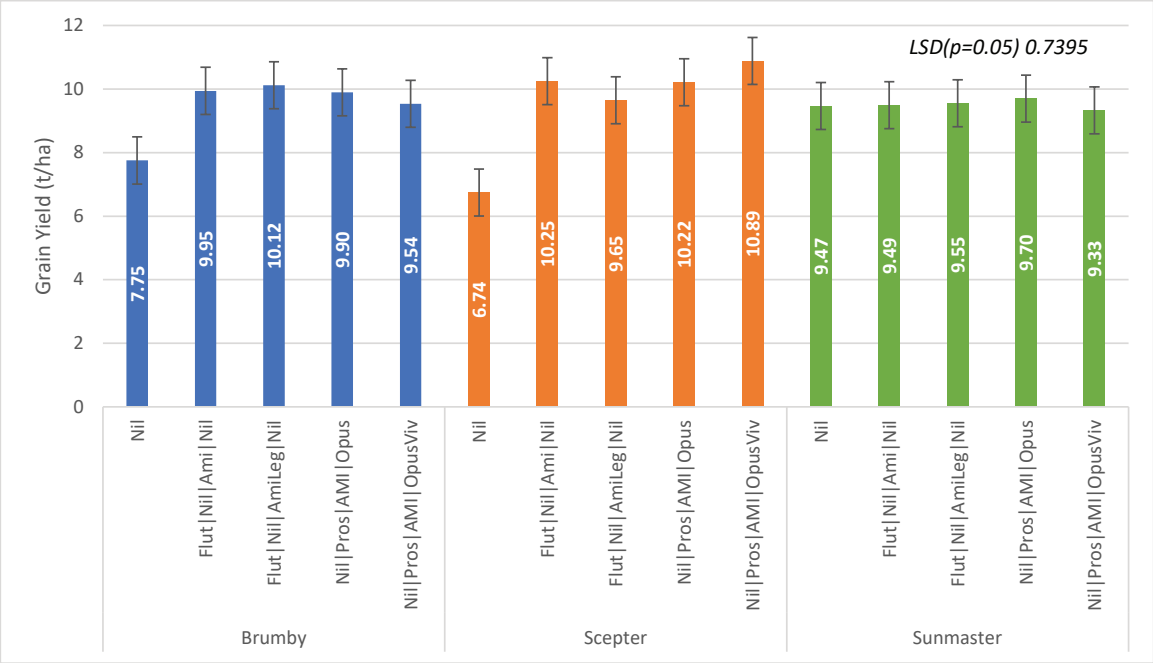

### Trial 2 Germplasm x Fungicide Strategy Trial

The overall average yield of the trial was 9.50 t/ha, with no statistical significance between the yields of the varieties. Brumby averaged 9.54 t/ha, Scepter 10.89 t/ha and Sunmaster 9.33 t/ha. For fungicide strategy the only treatment to yield significantly lower than all other treatments was the Nil, yielding 7.99 t/ha.

The highest yielding treatment overall was the Nil|Pros|AMI|OpusViv for Scepter yielding 10.89 t/ha, figure 5. This was statistically higher than all other treatments except for the Flut|Nil|Ami|Nil treatment for Scepter (10.25 t/ha) and the Nil|Pros|AMI|Opus treatment for Scepter (10.22 t/ha). The lowest yielding treatment in the trial was the Nil treatment for Scepter (6.74 t/ha), which was statistically lower than all other treatments.

For Brumby the Nil was the lowest yielding treatment (7.75 t/ha) and the highest yielding treatment was the Flut|Nil|AmiLeg|Nil treatment (10.12 t/ha). For Sunmaster there was not a lot of difference between the yields of the treatments, with yields ranging from 9.33 t/ha for Nil|Pros|AMI|OpusViv to 9.70 t/ha for Nil|Pros|AMI|Opus.

Figure 5: Average grain yield of variety by fungicide strategy trial.




## Grain Quality (Analysed using ASReml)

Protein, screenings and test weight were all measured and analysed on each trial.

### Trial 1 Fungicide Product Trial

A summary of each of the grain quality parameters is shown in table 8.

*Protein:* The average grain protein of the trial was 11.31%. There were no significant difference between treatments for protein.

*Screenings:* The average screenings of the trial was 1.84%, with Nil (3.75%) having significantly higher screenings in the trial than all other treatments except Proviso (1.76%).

*Test Weight:* The average test weight of the trial was 80.07 kg/HL. The treatment which had the lowest test weight in the trial was Nil (76.17 kg/HL), significantly lower than all other treatments.

Table 8: Protein, screenings and test weight for fungicide product trial.

| Trt No. | Treatment | Grain Protein (%) | Screenings (%) | Test Weight (kg/HL) |
|---|---|---|---|---|
| 1 | Nil | 11.21 | 3.75 | 76.17 |
| 2 | Vivando + Opus | 11.34 | 1.61 | 80.73 |
| 3 | Talendo + Opus | 11.34 | 1.60 | 80.70 |
| 4 | Legend + Opus | 11.31 | 1.55 | 80.67 |
| 5 | Orius | 11.26 | 1.64 | 80.50 |
| 6 | Proviso | 11.23 | 1.76 | 79.94 |
| 7 | Opus | 11.36 | 1.68 | 80.56 |
| 8 | Radial | 11.36 | 1.57 | 80.48 |
| 9 | Prosaro | 11.38 | 1.61 | 80.59 |
| 10 | Proviso + Opus + Orius | 11.28 | 1.67 | 80.41 |
| | ***mean*** | ***11.31*** | ***1.84*** | ***80.07*** |
| | ***Lsd (p=0.05)*** | ***ns*** | ***0.330*** | ***0.785*** |

## Trial 2 Germplasm x Fungicide Strategy Trial

A summary of each of the grain quality parameters is shown in tables 9.

*Protein:* The average grain protein of the trial was 11.51%. Sunmaster (11.69%) had significantly greater protein than both Brumby (11.42%) and Scepter (11.41%). The Nil (11.36%) treatment across varieties had the lowest grain protein, statistically lower than all other treatments except Flut|Nil|AmiLeg|Nil (11.45%).

*Screenings:* The average screenings of the trial was 1.74%, with Scepter having significantly greater screenings than both Brumby 1.55%) and Sunmaster (1.51%). The Nil treatment across varieties had the greatest screenings with 2.75%, statistically greater than all other treatments.

*Test Weight:* The average test weight of the trial was 80.73 kg/HL. Sunmaster (82.21 kg/HL) had statistically a greater test weight than both Brumby (79.96 kg/HL) and Scepter (80.02 kg/HL). The Nil treatment across varieties had the lowest test weight with 48.62 kg/HL, statistically lower than all other treatments.

Table 9: Protein, screenings and test weight for variety by fungicide strategy trial.

**Protein (%)**

| Fungicide Treatment | Brumby | | Scepter | | Sunmaster | | AVERAGE | |
|---|---|---|---|---|---|---|---|---|
| Flut\|Nil\|AmiLeg\|Nil | 11.43 | *cdef* | 11.20 | *f* | 11.71 | *ab* | *11.45* | *ab* |
| Flut\|Nil\|Ami\|Nil | 11.57 | *abcde* | 11.42 | *cdef* | 11.78 | *a* | *11.59* | *a* |
| Nil | 10.91 | *g* | 11.67 | *abc* | 11.50 | *bcd* | *11.36* | *b* |
| Nil\|Pros\|AMI\|Opus | 11.63 | *abcd* | 11.41 | *def* | 11.69 | *ab* | *11.58* | *a* |
| Nil\|Pros\|AMI\|OpusViv | 11.55 | *bcde* | 11.37 | *ef* | 11.75 | *ab* | *11.56* | *a* |
| ***mean*** | ***11.42*** | | ***11.41*** | | ***11.69*** | | ***11.51*** | |
| ***Lsd (p=0.05)*** | ***0.257*** | | ***0.257*** | | ***0.257*** | | ***0.149*** | |

**Screenings (%)**

| Fungicide Treatment | Brumby | | Scepter | | Sunmaster | | Average | |
|---|---|---|---|---|---|---|---|---|
| Flut\|Nil\|AmiLeg\|Nil | 1.51 | *cd* | 1.55 | *cd* | 1.74 | *bc* | *1.60* | *b* |
| Flut\|Nil\|Ami\|Nil | 1.50 | *cd* | 1.54 | *cd* | 1.57 | *cd* | *1.54* | *b* |
| Nil | 2.18 | *b* | 4.59 | *a* | 1.47 | *cd* | *2.75* | *a* |
| Nil\|Pros\|AMI\|Opus | 1.13 | *d* | 1.56 | *cd* | 1.42 | *cd* | *1.37* | *b* |
| Nil\|Pros\|AMI\|OpusViv | 1.42 | *cd* | 1.61 | *c* | 1.33 | *cd* | *1.46* | *b* |
| ***mean*** | ***1.55*** | | ***2.17*** | | ***1.51*** | | ***1.74*** | |
| ***Lsd (p=0.05)*** | ***0.460*** | | ***0.460*** | | ***0.460*** | | ***0.265*** | |

**Test Weight (kg/HL)**

| Fungicide Treatment | Brumby | | Scepter | | Sunmaster | | Average | |
|---|---|---|---|---|---|---|---|---|
| Flut\|Nil\|AmiLeg\|Nil | 79.89 | *e* | 81.37 | *bcd* | 81.86 | *abc* | 81.04 | *a* |
| Flut\|Nil\|Ami\|Nil | 80.16 | *e* | 81.30 | *bcd* | 82.04 | *ab* | 81.17 | *a* |
| Nil | 78.54 | *f* | 75.25 | *g* | 82.07 | *ab* | 78.62 | *b* |
| Nil\|Pros\|AMI\|Opus | 80.87 | *cde* | 80.88 | *cde* | 82.52 | *a* | 81.43 | *a* |
| Nil\|Pros\|AMI\|OpusViv | 80.32 | *de* | 81.28 | *bcd* | 82.54 | *a* | 81.38 | *a* |
| ***mean*** | ***79.96*** | | ***80.02*** | | ***82.21*** | | ***80.73*** | |
| ***Lsd (p=0.05)*** | ***1.109*** | | ***1.109*** | | ***1.109*** | | ***0.583*** | |

*Note: Means followed by same letter do not significantly differ*

## DISCUSSION:

2023 was the first year of the project and was a season which did not favour the development of powdery mildew. Very few pustules of powdery mildew could be found in the trial, although there were higher levels of other diseases such as stripe rust and septoria. The level of these diseases were therefore assessed as part of this trial.

The product trial showed that any product used in 2023 was better than no product at all, with yield significantly reduced where no fungicides were applied. Regardless of fungicide product used, disease levels, in particular stripe rust, were significantly less in treated plots compared to the untreated control.

In the variety by fungicide trial, whilst all the varieties in the trial were susceptible to septoria, they varied in their stripe rust resistance. Where fungicide strategies were compared between varieties, it showed that regardless of product used with MS-S varieties like Scepter, in the presence of disease such as stripe rust, it was important to spray for disease in a planned approach. Variety choice made a difference. Sunmaster with its MRMS rating to stripe rust had no statistical difference in grain yield between any of the treatments, including the untreated control. Whereas Brumby and Scepter, which are more susceptible to stripe rust, yielded significantly less where no fungicides were applied.

The trials will be repeated at both sites again in 2024 to further improve our understanding of powdery mildew in wheat and the cost-effective management strategies that reduce yield loss and further minimise the development of fungicide resistance. Conducting the trials over multiple seasons, and sites, ensures more data is generated and captures varying seasonal conditions that may impact disease development.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