



VICTORIA HVC
RESEARCH CENTRE



Thursday 29 October 2020

Gnarwarre, Victoria



Trial site kindly hosted by Ewen Peel

The GRDC Hyper Yielding Crops project is led by FAR Australia in collaboration with:



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VISITOR INFORMATION

We trust that you will enjoy your time with us at our Victorian Hyper Yielding Crops (HYC) small group field day sessions. Your health and safety is paramount, therefore whilst on the property we ask that you both read and follow this information notice.

HEALTH & SAFETY

- All visitors are requested to follow instructions from FAR Australia staff at all times.
- All visitors to the site are requested to stay within the public areas and not to cross into any roped off areas.
- All visitors are requested to report any hazards noted directly to a member of FAR staff.

FARM BIOSECURITY

- Please be considerate of farm biosecurity. Please do not walk into farm crops without permission. Please consider whether footwear and/or clothing have previously been worn in crops suffering from soil borne or foliar diseases.

Thank you for your cooperation, enjoy your small group session.

COVID–19 Event Operating Protocols

For the health and safety of all staff and field day attendees, please ensure that you read and comply with the following COVID-19 operating protocols, in accordance with current VIC Health Orders.

- You have completed and signed an event COVID-19 Self Declaration form upon arrival.
- You understand and will adhere to the Victorian Government and Health Department COVID-19 health orders. Hygiene and Social Distancing requirements are extensively promoted around the Site.
- All participants arrive, tour and then leave. There is to be no socialising on the site after the event.
- All participants are asked to bring their own food and refreshments.
- All participants are strongly requested to advise FAR Australia immediately should they feel or become unwell within 14 days of attending this event.

Our nominated First Aid responder for the event is Darcy Warren 0455 022044.

Social Distancing and Hygiene

Please ensure that you continue to maintain a minimum of 1.5m between individuals.

- We are applying the minimum 4sq. meters per person and maximum attendance of 10 people for the event.
- All attendees are recommended to bring their own sanitiser, mask and hygiene products. FAR Australia will also have a supply of hand sanitiser on the day.
- Hand sanitiser will be available at the entrance / exit to the site and at other various well marked locations around the site.

Field Day Access

Please ensure that you only enter and exit, within your vehicle, via the designated gate(s).

Thank you for your understanding. We appreciate your attention and co-operation in helping us to deliver an educational and safe event.

FAR Australia

WELCOME TO THE VICTORIA HYPER YIELDING CROPS FIELD DAY

On behalf of the project team, I am delighted to welcome you to the 2020 Victoria Hyper Yielding Crops (HYC) project research site here at Gnarwarre, near Geelong.

Led by the Foundation for Arable Research (FAR) Australia, the Hyper Yielding Crops (HYC) Project is a new initiative funded by the Grains Research and Development Corporation (GRDC) which aims to push the economically attainable yield boundaries of wheat, barley and canola. HYC builds on the success of the GRDC's four-year Hyper Yielding Cereals Project in Tasmania, which demonstrated that it is possible to significantly increase yields through sowing the right cultivars and effective implementation of appropriately tailored management strategies. Whilst the project team is clearly aware that Tasmania is not in southern Victoria, they believe there are some common threads to the research that could benefit our new mainland project HYC initiative. The first is the ability to explore a research centre that can look at the latest developments in germplasm whilst at the same time examine all the major agronomic inputs. This may not appear very unique but when laid out across a number of different research sites, this can be rather powerful. The second point is that across Australia, sowing dates are moving forward, and as a consequence, our germplasm requirements are changing. Both Victorian research sites were late April sown and as a result we are screening both winter and spring germplasm in order to establish whether longer season germplasm has any fit in a southern Victorian environment. In some cases, we are looking to see if overseas bred material offers any steps forward in the way that RGT Planet and Accroc did in 2016. Combined with a return to a wetter season we also have a strong focus on disease control, since fungicide technology along with fungicide resistance has developed considerably over the last decade.

As well as the five HYC Research Centres across the higher yielding regions of southern Australia (NSW, WA, SA, VIC and TAS) the project wants to engage with you to scale up the results and create a community network aiming to lift productivity. If you are interested in getting involved in the project then please get in touch (see contact details in this booklet).

What's happening on the Victorian HYC Centre in 2020?

The Hyper Yielding Crops (HYC) Research Centre this season has wheat, barley and canola focus and is exploring germplasm and agronomic input:

- Elite germplasm screening - the phenology, disease resistance and standing power of new wheat, barley and canola germplasm including new Australian as well as overseas germplasm that might offer advances in productivity – is there something to reliably outperform our current standards?
- HYC G.E.M. (Genotype. Environment. Management) trials - what are the management package combinations (winter vs spring germplasm, N PGR's and Fungicide) that deliver the highest final harvest dry matters, harvest indices and grain yields?
- What level of fungicide input is appropriate for germplasm sown in late April?
- In addition, the project team is looking at how high you can push nutrition in the higher yielding regions? For example, in the Hyper Yielding Cereals project in Tasmania 15t/ha crops did not respond to very high inputs of applied nitrogen (over 220-225kg N/ha) indicating that the fertility of the farming system is important to meet the needs of the crop as well as the artificial fertiliser applied.

Should you require any assistance throughout the session, please don't hesitate to contact a member of the FAR Australia team who will be more than happy to help.

Thank you once again for taking the time to join us today; we hope that you find the presentations useful, and as a result, can take away new ideas which can be implemented in your own farming business.

Finally, I would like to thank the GRDC for investing in the Hyper Yielding Crops project and Ewen Peel for hosting us on the farm.

Nick Poole
Managing Director
FAR Australia



Funding Acknowledgements

The Hyper Yielding Crops project team would like to place on record its grateful thanks to the Grains Research & Development Corporation (GRDC) for its funding support for this event and featured projects.

What is the Hyper Yielding Crops project aiming to achieve and how did it originate?

Hyper Yielding Crops (HYC) builds on the success of the GRDC's four-year Hyper Yielding Cereals Project in Tasmania, which attracted a great deal of interest from mainland HRZ regions. The project demonstrated that increases in productivity could be made through sowing the right cultivars, at the right time and with effective implementation of appropriately tailored management strategies. The popularity of the original project highlighted the need to advance a similar initiative nationally which would strive to push crop yield boundaries in high yield potential grain growing environments.

With input from national and international cereal breeders, growers, advisers and the wider industry, this project is working towards setting record yield targets as aspirational goals for growers of wheat, barley and canola.

In addition to the research centres, the project also includes a series of focus farms and innovative grower networks, which are geared to road-test the findings of experimental plot trials in paddock-scale trials. This is where in the extension phase of the project we are hoping to get you, the grower and adviser involved.

Focus farm projects in the region have been set up by Ashley Amourgis of Southern Farming Systems working with industry and we will be looking to secure a small number of wheat entries this harvest for the HYC awards, which have been set up as part of the efforts to try and lift interest across the board in higher productivity.

The HYC awards aim to benchmark the yield performance of growers' wheat paddocks and, ultimately, identify the agronomic management practices that help achieve high yields in variable on-farm conditions across the country. This season HYC project officers are seeking nominations of 50 wheat paddocks nationwide (about 10 paddocks per state) as part of the awards program.

For more details on the project contact:

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Nick Poole – HYC Project Leader and wheat crop research lead, FAR Australia
(nick.poole@faraustralia.com.au)

Rohan Brill – HYC Canola crop research lead, Brill Ag (rohan@brillag.com.au)

Kenton Porker – HYC Barley crop research lead, SARDI (kenton.porker@sa.gov.au)
Jon Midwood – HYC extension coordinator, Techcrop (techcrop@bigpond.com)
Ashley Amourgis – HYC Project Officer (VIC), Southern Farming Systems
(aamourgis@sfs.org.au)

The following papers were presented at the southern NSW HYC Field Day on the 8th October and are published here for your interest. They are not specific to southern Victoria.

Stripe Rust Management in Wheat

Nick Poole, Tracey Wylie, Kat Fuhrmann

Foundation for Arable Research (FAR) Australia, Bannockburn, Victoria 3331, Australia

Stripe rust caused by the pathogen *P. striiformis* var. *tritici* has been more problematic as result of a change of pathotype (pt. 198 E16 A+ J+ T+ 17+) and the susceptibility of some widely grown cultivars, particularly DS Bennett and LPB Trojan. This pathotype was first detected near Wagga Wagga in late August 2018, and in 2019 it was the most common pathotype isolated from eastern Australia having spread to Victoria and Tasmania in the south and Queensland in the north. This pathotype poses an increased threat to several wheat varieties (e.g. DS Bennett and LPB Trojan and to a lesser extent Devil, Illabo, DS Darwin, Emu Rock and Hatchet CL Plus), several durum varieties (e.g. DBA Artemis, DBA Bindaroi, DBA Lillaroi, DBA Spes, DBA Vittaroi and EGA Bellaroi), and several triticale varieties (Astute, Joey and Wonambi) (Source: University of Sydney Cereal Rust Report 2020 Vol 17, Issue 2).

The situation with stripe rust is reminiscent of the 2003 – 2005 seasons in southern NSW when the wheat cultivar H45 was widely grown and foliar fungicides became more widely used in the region. The following key points and data tables illustrate that much of what we learnt about stripe rust control in the early part of new millennium is still relevant today. The following key points are a summary of some of what was learnt out of a GRDC project run between 2012 – 2017 when FAR Australia collaborated with the University of Sydney at Cobbitty in NSW.

Using foliar fungicides as part of an Integrated Disease Management (IDM) strategy to control stripe rust

KEY POINTS

- Use fungicides as the final part of an Integrated Disease Management (IDM) strategy after incorporating genetic resistance and cultural control.
- The key timings to consider foliar fungicide application are in the stem elongation period (GS30-39), since these timings will maximise green leaf retention in the top four leaves of the canopy.
- Fungicides applied at early stem elongation (GS30-32) provide good protection of leaves in the lower canopy, particularly flag-2 and flag-3, whilst fungicides applied at flag leaf emergence (GS39) provide good control of disease in the top of the canopy, particularly the flag and flag-1 leaves.
- The specific need for fungicide application will depend on growth stage at the onset of disease, cultivar resistance, whether 'at sowing' measures (e.g. flutriafol) have been used and predicted climatic conditions for the coming weeks.
- In moderately susceptible cultivars fungicides applied at GS30-32 or at sowing do not prevent reinfection of leaves in the upper canopy later in the season if

conditions for disease development remain conducive. This potentially means a further fungicide application may be warranted at flag leaf emergence (GS39).

- Adopting cultivars with greater levels of genetic resistance (i.e. rated MR-MS) rarely results in the application of more than one fungicide being economical and allows greater flexibility in fungicide timing during the stem elongation period (GS30-39). It is not economical to apply fungicides in varieties rated MR or better.
- Foliar fungicides only protect the leaves that have emerged at the time of application and are less effective where leaves are already visibly infected. That is, fungicides have better protectant than curative activity.
- A prophylactic fungicide application at full head emergence (GS59) will provide partial control (50-75%) of stripe rust head infections, but in most cases are applied too late to protect against infection of the important top four leaves.
- A greater reduction in the extent of head infection can be achieved by sowing varieties with higher levels of genetic resistance and/or controlling infection in the canopy prior to head emergence and flowering.
- The overall yield response to fungicide application is smaller in varieties with higher levels of genetic resistance which limits differences in the efficacy of different products and generally makes application uneconomical.
- There was no evidence that newer fungicide mixtures containing a triazole (epoxiconazole) in combination with a strobilurin or Succinate Dehydrogenase Inhibitors (SDHI's) active ingredient provided a significant improvement in disease control over epoxiconazole or tebuconazole alone.
- Fungicide applications have not produced economic returns in wheat crops with a yield potential of 4-6 t/ha when the severity of stripe rust infection on the flag leaf in untreated plots was only 10% or less at the start of grain filling. That is, the level of disease controlled was not enough to warrant protection through application of a fungicide.

To assist with the interpretation of these key points it is important to remember at which approximate development stage the key leaves in the cereal crop canopy emerge.

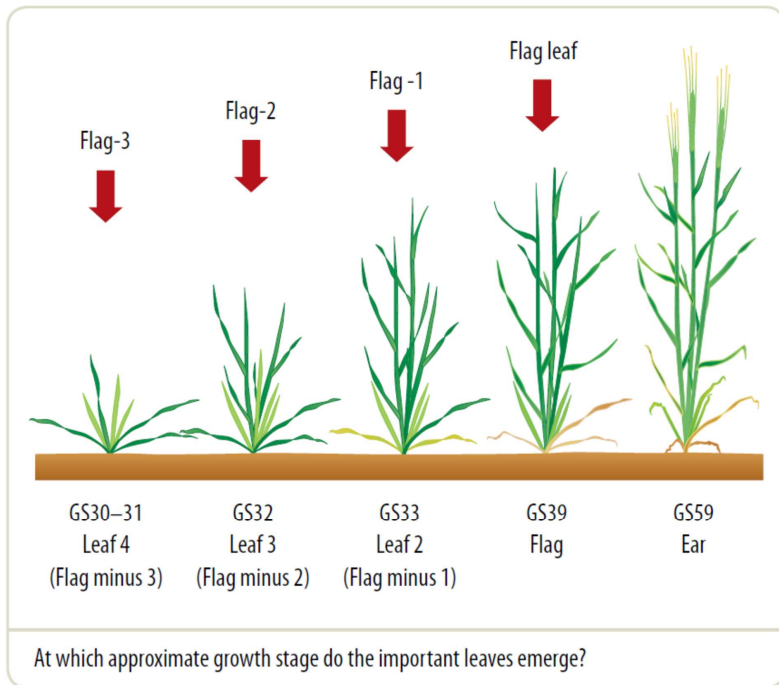


Figure 1. Diagram of growth stage and the corresponding leaf emergence.

2020 Fungicide performance (Provisional mid-season results – caution!)

At sowing measures for stripe rust control

In irrigated FAR Australia trials funded by the GRDC this season at Finley, results would indicate that flutriafol is still performing strongly as an at sowing measure on the fertiliser giving 80-90% control of stripe rust. This active ingredient was shown to give good control up to flag leaf in 2003-2005 and in 2020. Provisional results on the durum DBA Vittaroi are indicating better control than that observed with Jockey or Systiva seed treatments.

Foliar Fungicide performance

In southern Victoria, using the variety DS Bennett, foliar fungicides have been tested at GS31 and GS39 using two spray approaches. In these trials epoxiconazole used alone has performed strongly against stripe rust and as indicated in previous work conducted by FAR Australia working with Sydney University there has been no advantage to newer fungicide mixtures containing a triazole in combination with a strobilurin or Succinate Dehydrogenase Inhibitors (SDHI's) (Table 1). We await the late season assessments and

yield results to see if the fungicide mixtures will confer other green leaf retention benefits. It's important to emphasise that these are interim results.

Table 1. Stripe rust control with foliar fungicides assessed 23 September 2020 at booting GS39-45 cv. DS Bennett following application at GS31 and 39 – Gnarwarre, Victoria.

Product	Rate mL/ha	Active ingredients (g ai/ha)	% Leaf area infected (Active pustules & associated necrosis)			
			Flag - 1		Flag-2	
			Active	Necrosis	Active	Necrosis
Untreated			0.7 a	7.6 a	4.9 abc	17.4 a
Radial	600	Epoxiconazole 45g + azoxystrobin 45g	0.0 bc	1.6 de	1.6 e	6.7 h
Soprano 500	125	Epoxiconazole 62.5g	0.1 bc	2.3 cde	2.3 de	6.2 h
Aviator Xpro	300	Prothioconazole 45g + bixafen 22.5g	0.1 bc	1.8 de	6.3 a	10.6 cde
Aviator Xpro	500	Prothioconazole 75g + bixafen 37.5g	0.0 c	1.3 e	5.2 ab	6.9 gh
Tazer Xpert + Banjo	500	Epoxiconazole 15.6g + azoxystrobin 40g	0.1 bc	2.6 cde	3.4 b-e	8.8 e-h

Figures followed by different letters are determined to be statistically different at a confidence level of 95%.

A – adjuvant (Banjo)

Disease Management in Wheat

Nick Poole, Kat Fuhrmann & Tracey Wylie

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Septoria tritici blotch (STB) and late leaf rust control

These two diseases have been very destructive in April sown wheat crops over the last two years in research conducted at the SA CTC given the yield potential this season, growers in the South East region will need to consider a third fungicide for susceptible cultivars, which is unusual for mainland crops. A “head wash” fungicide where needed has two roles in wheat crops; firstly, it protects the newly emerged head and secondly and more importantly with late leaf rust it “tops up” the protection of the flag leaf that was sprayed earlier at flag leaf emergence (GS39). It is important to remember that these fungicide applications are generally better to be employed at head emergence/early flower rather than late flowering/early grain fill. There are two reasons for this; firstly, fungicides applied after flowering are generally less economic and in danger of breaking withholding periods or timing window restrictions; secondly, some head diseases can only be protected against provided the application is made before the disease is visible in the head e.g. stripe rust in the head.

Last season in SQP Revenue a combination of STB and leaf rust reduced the yield of the untreated crop to under 4t/ha, and with the best two spray programme (GS31 & GS39 – no head wash), yields were increased to just shy of 9t/ha. A 2019 trial at the SA CTC looking at the influence of product and timing revealed a number of important points with regards to disease control and yield response (Figure 1).

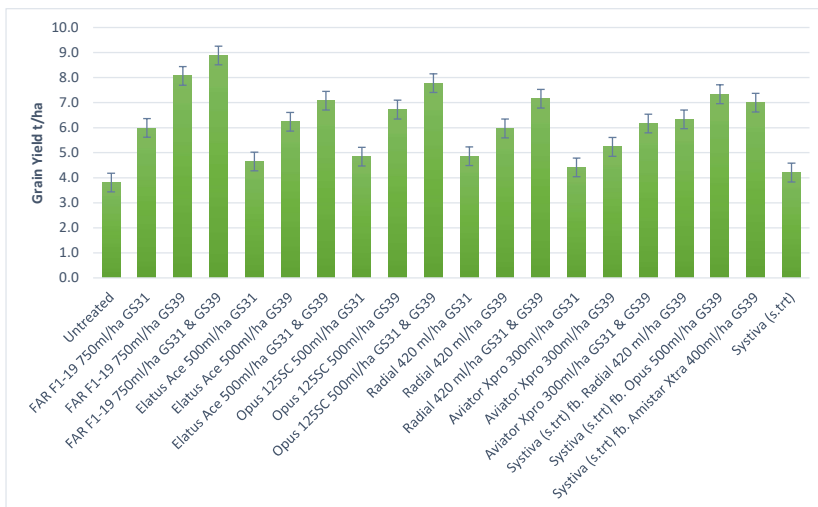


Figure 1. Yield (t/ha) of fungicide treatments – SQP Revenue, SA CTC 2019

FAR Australia gratefully acknowledges the funding support of Nutrien Ag Solutions (formally Landmark) in order to generate this independent research in the region and the collaborative input of SARDI and Brett Gilbertson in managing this research trial.

Note that from the perspective of reducing fungicide resistance risk it is always advisable to avoid repeating the application of the same fungicide product at two consecutive timings. In this case it has been done for experimental reasons to establish the strengths and weaknesses of products.

Key points

- Throughout the trial all fungicide products demonstrated a similar pattern of yield response with the greatest response as a result of two applications.
- Results indicated that GS31 fungicides whilst effective for STB on lower leaves do not control disease on the flag leaf in HRZ long season scenarios.
- When only one fungicide application was made the flag leaf spray was more effective than a single spray at stem elongation, particularly for leaf rust control, however both together were superior.

Clearly not all cultivars are as susceptible as SQP Revenue but be vigilant for active leaf rust, since this can be a major yield robber. The results in 2019 in a susceptible cultivar indicated that yield can be lost by depending on lower rates of fungicide applied at flag leaf (e.g. comparison of Radial 420ml/ha – lower rate on label compared to Opus 500ml/ha). New chemistry such as Radial or Aviator Xpro whilst extremely effective will still be subject to lower levels of persistence in a longer season with higher disease pressure. Therefore, do not rule out a head wash spray where flag sprays have been

made with lower label rates and make sure head wash product has good activity on leaf rust (Figure 2).

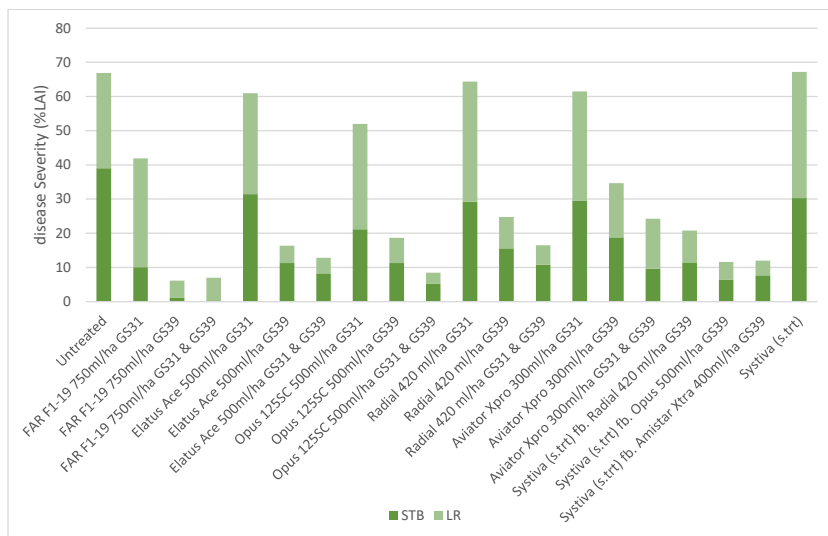


Figure 2. Septoria tritici blotch (STB) and Leaf Rust (LR) disease severity on flag leaf on 5 November at the end of flowering 81DA-A and 42DA-B – SQP Revenue, SA CTC 2019.

Fungicide Resistance

There has been a number of reports of wheat powdery mildew (WPM) head infection in Scepter in NSW and the Vic border region. In terms of fungicide application for this disease and other diseases such as stripe rust head infection remember head wash sprays are most effective shortly after the main stem heads have emerged or just prior to flowering (GS59-61). WPM strains resistant to strobilurin or Group 11 Qol fungicides (azoxystrobin, pyraclostrobin) have now been identified in Victoria, NSW and SA. Where these strains are present strobilurins will not be effective. With the geographic spread of these resistant strains it would be sensible to assume that it is only the triazole component of formulated fungicide mixtures that will be effective for control of the disease. For example, if you were using Radial against WPM on the head it would be the epoxiconazole component of the mixture that would be most effective or if was Amistar Xtra only the cyproconazole component not the strobilurin azoxystrobin. In these cases, remember that the rate of the triazole component would be important to maintain activity against the disease.

“Erect Head” Control in April Sown Wheat

¹Nick Poole, Kat Fuhrmann, Tracey Wyllie¹, ²Amanda Pearce & Ian Ludwig, ³Brett Davey

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²SARDI, Struan Research Centre, Naracoorte SA 5271,

³Southern Farming Systems, Longford, TAS, 7301

Over the last two seasons there have been a number of observations indicating that shortly before harvest wheat crops at our SA Crop Technology Centre (CTC) and the Hyper Yielding Cereals research site in Tasmania produce a number of erect heads with poor grain fill. These symptoms show up only 3 -4 weeks before harvest, before which the crop can appear generally healthy.

In 2018 it was noted that the cultivars Manning and DS Bennett had lower levels of these erect heads at harvest, suggesting that there was a genetic basis to their protection. There are a number of possible causes (frost effects, poor pollination, stem base disease) that Hyper Yielding Crops (HYC) research is investigating, however it is our understanding that Manning and DS Bennett are the only wheat cultivars with BYDV tolerance that are commercially available in Australia (formerly also MacKellar). In 2019, research was established in Tasmania and SA to look at this in more detail to pin down whether BYDV was linked to erect heads at harvest and whether BYDV tolerant wheat offered a significant advantage. Lower levels of BYDV at the SA CTC led to inconclusive results in 2019 but in Tasmania BYDV tolerance conferred dramatic effects with an early April sown Manning crop compared to a non-tolerant cultivar RGT Relay. In the non-tolerant cultivar where different insecticide regimes (Table 1) were employed, it was clear that where BYDV was fully controlled the number of erect heads at harvest was reduced (Figure 1). The effect of controlling BYDV and erect heads at harvest had significant effects on grain yield (Figure 2) indicating the value of this trait in wheat germplasm grown in the HRZ.

Table 1. Trial treatment list (ml/ha) conducted on BYDV tolerant (cv Manning) and non-tolerant (cv RGT Relay) cultivars.

TRT	Product and Rate (ml/ha)				
	Seed trt	GS12	GS12+2 weeks	GS12+4 weeks	GS31
1 & 10					
2 & 11		Karate Zeon 40	Transform 100	Dominex Duo 125	
3 & 12		Karate Zeon 40	Transform 100	Dominex Duo 125	Dominex Duo 125
4 & 13	Pontiac				
5 & 14	Pontiac		Transform 100		
6 & 15	Pontiac		Transform 100	Dominex Duo 125	
7 & 16	Pontiac		Transform 100	Dominex Duo 125	Dominex Duo 125
8 & 17	Pontiac	Karate Zeon 40	Transform 100	Dominex Duo 125	
9 & 18	Pontiac	Karate Zeon 40	Transform 100	Dominex Duo 125	Dominex Duo 125

Please note that the treatment list for this trial was established to identify whether viral issues were the cause of erect heads at harvest. This level of insecticide input was adopted purely for research purposes and presentation of results is not in any way a recommendation.

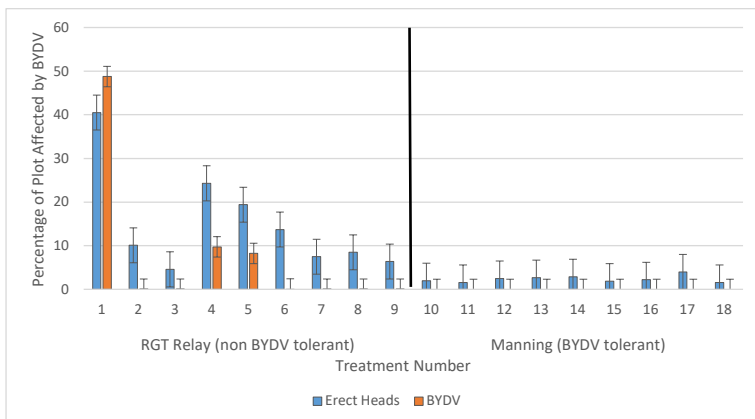


Figure 1. Percentage of plot showing erect heads at crop maturity (GS99) compared to plot BYDV infection, assessed on October 25 (GS37) - HYC Research site, Tasmania 2019.

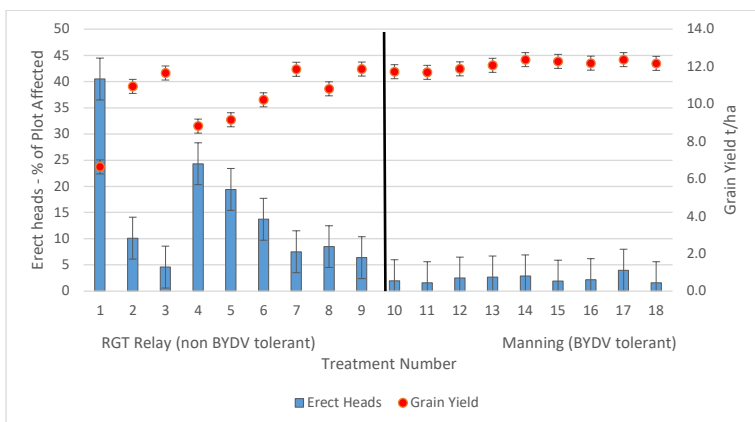


Figure 2. Percentage of plot showing erect heads at crop maturity (GS99) in relation to final grain yield (t/ha) – HYC Research site, Tasmania 2019.

With the introduction of BYDV tolerance into the UK with wheat cultivar RGT Wolverine (first European BYDV resistant cultivar to be released), it is ironic that the only other breeding programmes to achieve this anywhere else in the world was the CSIRO HRZ wheats’ programme (now discontinued). The ban on neonicotinoid seed treatments in Europe has made this wheat trait even more important. It is our understanding that the technology used in Europe that has resulted in BYDV tolerance is the same as that

originally developed here in Australia by CSIRO. The CSIRO BYDV tolerance involved translocating a genetic segment from *Thinopyrum intermedium* (a distant relative of wheat) containing Bdv2 onto a wheat chromosome, via a research line. Recent advances in molecular markers have fast tracked some of these developments. With the prevalence of the green bridge in HRZ regions this breeding trait is ideally suited to maximising HRZ grain production without the use of insecticides.

N.B. Please note that the high levels of insecticide usage in this experimentation was adopted to assess whether virus transmitted by aphids was indeed one of the principal causes of erect head issues in HRZ wheat production.

Drivers of Yield Potential in Crops

John Kirkegaard, CSIRO Agriculture and Food, Canberra

The Hyper-Yielding Crops Project has a specific focus on the factors that determine the potential crop yield in high yielding environments, and this is not just rainfall. Some of the highest yielding areas of the world (in northern England and NZ with 16 t/ha wheat, 6 t/ha canola) share similar annual rainfall to parts of Australia. So - what are the key factors?

- (1) Phenology – fitting the crop to the growing season
 - Achieve the optimum flowering time to minimise stress in the “critical period”
 - Critical period = when grain number is set = yield potential
 - For wheat, 3 weeks before anthesis
 - For canola and legumes, 1-3 weeks after start of flowering
 - Sowing and harvest to maximise season length
- (2) Capture resources to grow enough biomass to hit yield potential
 - Light and temperature (=growth)
 - Water
 - Nitrogen
- (3) Protect the potential – manage constraints (weed, diseases, lodging)
 - Agronomy, economics, risk

At Wallendbeen, the optimum flowering periods that minimise stress in the critical period in the long-term are:

For wheat: ~mid-October

For canola: ~end August

This timing reduces the combined risk of heat, frost, drought on crops in the critical period.

Selecting varieties and sowing dates that achieve these flowering periods will maximise the yield potential on average, although in specific seasons the optimum will move around.

Managing to reduce water and N limitation in the critical period also maximises grain number and yield potential.

Water supply and yield potential.

- The most efficient wheat crops are able to grow 22 kg/ha grain for every mm of water used above a minimum evaporation of 60mm.
- The most efficient canola crops are able to grow 14 kg/ha grain for every mm of water used above a minimum evaporation of 60mm.

For Wallendbeen the average annual rainfall is 620mm; April-November is 432mm
December to March (fallow) rainfall is 188mm (30% can be stored = 56mm).

- On average, potential yield for wheat can be estimated as $[432 + 56 - 60] \times 22 = 9.4$ t/ha.

- On average, potential yield for canola can be estimated as $[432 + 56 - 60] \times 14 = 6.0$ t/ha.

Nitrogen supply and yield potential

- For every tonne/ha of wheat yield the crop needs to see 40 kg N/ha.
 - For every tonne/ha of canola yield the crop needs to see 80 kg N/ha.
- So a 10 t/ha wheat crop or a 5 t/ha canola crop needs **400 kg/ha N** supplied.

What's been achieved experimentally at Wallendbeen previously?

In 2001 to 2003 canola experiments on this farm demonstrate the predicted potentials using the above rules of thumb are possible (Kirkegaard et al., 2006).

Year	History	Fallow (mm)	GSR (mm)	Soil N (kg/ha)	N fert (kg/ha)	Actual Yield (t/ha)	Water limited yield (t/ha)	N limited yield (t/ha)
2001	P-P-P-P	180	370	382	20	5.5	5.1	6.3
2002	C-W-C-W	167	271	77	102	2.8	3.6	2.9
2003	C-W-C-W	184	409	192	104	2.8	5.7	4.3

*Assume mineralised N was 100 kg/ha after pasture (2001) and 50 kg/ha after crops.

In 2001 (following pasture) the measured yield (5.5 t/ha) exceeded the predicted water limited potential based on rainfall (possibly due to deeper water access on these deep soils) but approached the N-limited potential due to plentiful N following pasture.

In 2002 the crop was well below the water-limited potential, but matched the N-limited potential, as N was low after a series of 4 crops and only 102 kg N were added. Thus the crop only yielded up to the N applied.

In 2003 there was MORE water available than in 2001, but there was only half the yield. The crop was apparently not water limited or N limited, so other factors (frost, disease, others?) must have played a role.

Increase the Yield Potential of Canola in Hyper Yielding Crops

Rohan Brill, Brill Ag

The main aim of canola research in the Hyper Yielding Crops project is to determine how best to **build** crop yield potential, **convert** biomass into grain (harvest index) and **protect** crops from losing yield from disease (mostly blackleg and sclerotinia). The research focus in 2020 includes:

- Cultivar choice – a focus on identifying elite cultivars within variety groups. Choosing the right cultivar in Hyper Yielding Crop zones is imperative as this will have implications for biomass accumulation, conversion of biomass to grain and for disease management.
- Crop nutrition – a focus on managing nitrogen fertiliser so that the crop grows enough biomass for a high yield potential and at the right time to ensure a high harvest index.
- Disease management – a focus on fungicide management and cultivar resistance (especially for blackleg).

An important component of getting the best out of a canola variety is to ensure it flowers at the right time.

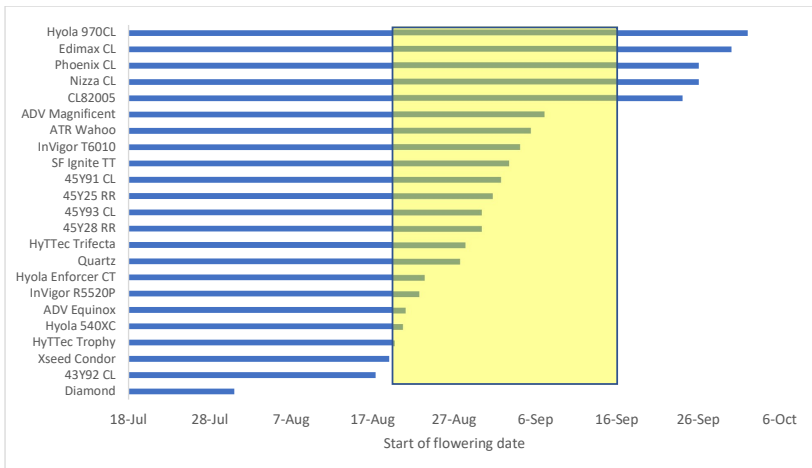


Figure 1. Flowering date of winter and spring cultivars sown on the 17 April at Wallendbeen in 2020. Overlaid onto it is the optimum start of flowering window that has been defined for nearby Young.

A range of nitrogen rates and timings was applied in a trial to 45Y28 RR. Biomass was measured at the start of flowering. Early applications (135 and 225 kg/ha at sowing) had the highest biomass at flowering (>8 t/ha) while split and flowering applications had biomass closer to 7 t/ha. The aim is to determine if nitrogen applied at flowering will be used more efficiently by the plant as the flowering stage is the critical period for crop growth.

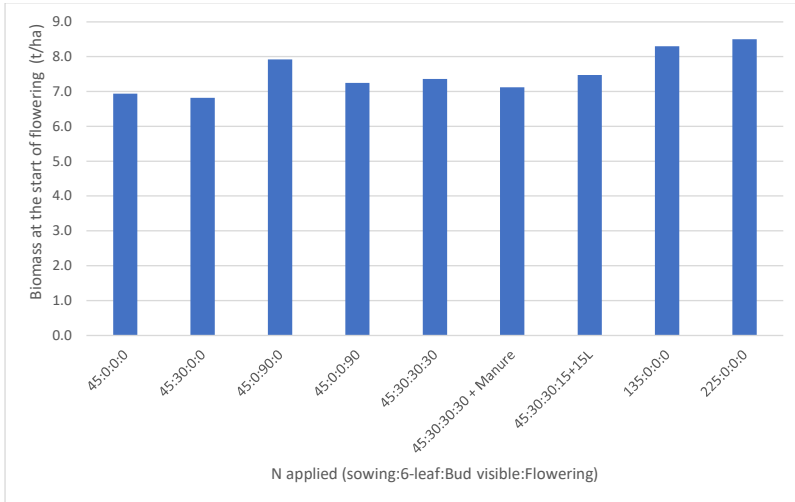


Figure 2. N applied (sowing:6-leaf: Bud visible: Flowering).

2020 Hyper Yielding Crops Site, Gnarwarre, VIC

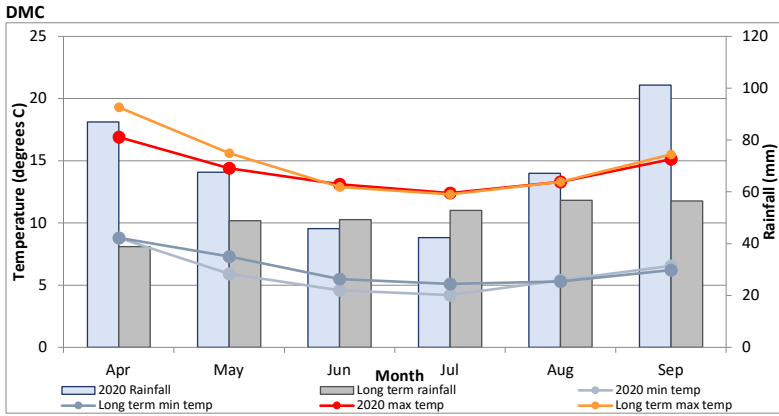


Figure 1. 2020 growing season rainfall and long term rainfall (1898-2020) (recorded at Winchelsea Post Office), 2020 min and max temperatures and long term min and max temperatures (1990-2020) (recorded at Sheoaks) for the growing season so far (April-September). *Rainfall April to September= 411.2mm.*

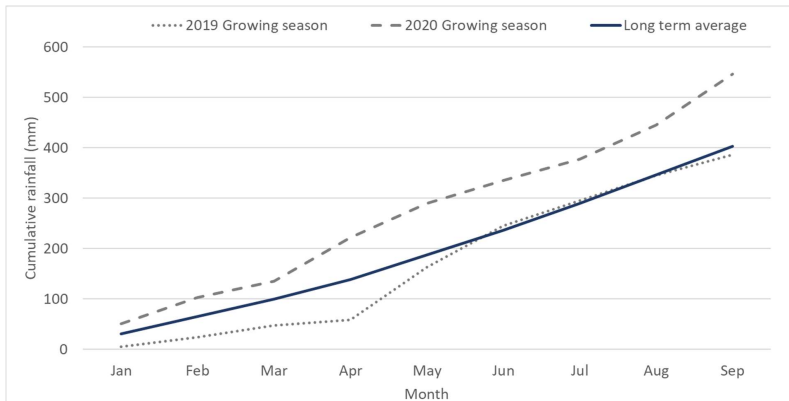


Figure 2. Cumulative growing season rainfall for 2019, 2020 and the long term average for the growing season so far (April- September).



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