Grains Research
UPDATE
Research Information for Farm Advisers from the
Grains Research and Development Corporation (GRDC)
Northern Region

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WINTER 2011

Barley leaf rust - lessons from 2010

Barley leaf rust was endemic in the northern region last year and caused severe losses in many crops. This was the first season for many years that the disease has been a problem and there are a number of reasons why it was so bad in 2010.

A rust epidemic has three drivers:

1. A susceptible host sown over a wide area

2. Plentiful inoculum that can attack that host and

3. Favourable environmental conditions.

Leaf rust levels had been building for several years prior to 2010 due to the popularity of varieties like Grout$^{\Phi}$ and Binalong$^{\Phi}$ whose resistance was overcome by a strain of rust in 2005. In early 2009, a new race of leaf rust developed and while this did not change the susceptibility of Grout$^{\Phi}$, it did render Fitzroy$^{\Phi}$ susceptible. There was significant over-summering of inoculum on volunteer plants throughout the 2009-2010 summer, providing inoculum for early sown crops. Furthermore, barley was sown from late April to mid July, providing a sequence of susceptible hosts. Early sown crops became infected with over-summering inoculum, rust increased on early crops, providing plentiful inoculum for main season sowings. The wet conditions in 2010 then triggered a major epidemic.

In 2010, crops became infected quite early, but good crop growth and the production of new leaf every 7 – 10 days masked the presence of the disease in many crops. With the frequent and sustained wet periods through the season and mild spring temperatures, the disease exploded.

Once growers and agronomists recognised there was a serious epidemic developing there was widespread application of foliar fungicides with mixed results.

Effectiveness of fungicides

Strategic fungicide application prior to infection is the most effective approach where required.

Fungicide efficacy is also influenced by inoculum load. On VS varieties where inoculum load is high and conditions favourable for disease development, the fungicide must 'work harder' to protect the plant. The disappointing results from many fungicide applications in 2010 could have been caused by several factors.

The most likely reason was that applications were just too late to cope with the exceedingly high inoculum loads.

Application too late. Heavy infection had already occurred when the fungicide was applied. It takes around 7-14 days from infection for a rust pustule to be visible. With a high inoculum load and a maximum kickback of 5 days, many sprays are likely to have been applied too late.

Inoculum pressure. The wide area of S and VS hosts and abundant inoculum placed extreme pressure on the fungicides requiring higher rates or superior fungicides to arrest epidemic development.

Fungicides

In 2010 the newer fungicides such as Opus®, Tilt® Xtra, Amistar® Xtra, Opera® and Prosaro® appeared to be more effective than older products in controlling leaf rust. All of these work best when applied strategically to the crop prior to infection to protect as much of the flag to flag-3 leaf area as possible before infection becomes established.

Control in 2011

Leaf rust is likely to be present in the 2011 cropping season. Rust has been found on volunteer plants growing over summer and this ensures some carryover into 2011. While the environment will still play a big part on how much develops, there are some measures that can be taken to avoid losses that occurred in 2010.

Sow more resistant varieties. Shepherd$^{\Phi}$, Mackay$^{\Phi}$ and Oxford$^{\Phi}$ are resistant to leaf rust and have the best resistance available in current commercial varieties.

Eliminate volunteers. Rust can only survive on live plants; so removal of any self-sown barley will reduce inoculum. A break of at least a month without green

plants is needed in a region to minimise the amount of over-seasoning inoculum.

Timely application of fungicides. Apply sprays as protectants before the disease develops on important leaves.

Good crop monitoring. The more susceptible a variety, the more attention needs to be given to early detection of disease. Initial inspection should be no later than GS31. When sampling the paddock, look into the crop canopy and at lower leaves. Low levels of leaf rust can usually be detected by the presence of green pin spots in yellowing tissue at the base of infected plants.

Leaf rust can reduce yields by over 60%; so it is important to keep ahead of the disease. Good crop monitoring, early detection and early intervention are necessary to protect potential yield in very susceptible varieties.

In favourable seasons, it is unlikely that a single fungicide application will protect a very susceptible variety from infection. Two sprays may be required with the first application at early jointing (growth stage 31-32) and a second application around late boot (growth stage 39-49).

Be alert; be prepared; be proactive. Rust epidemics are like bushfires – they are very difficult to contain once they get away.

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Floods and beneficial fungi – issues for summer crop nutrition

If planning to sow a summer crop dependent on arbuscular mycorrhizal fungi into country that has been flooded, there may be significant nutritional issues that will need to be addressed. If flooding has led to a prolonged period of anaerobic conditions, levels of beneficial arbuscular mycorrhizal fungi may have substantially reduced and P and Zn nutrition affected as a result.

Nikki Seymour, soil microbiologist with Department of Employment, Economic Development and Innovation (DEEDI), in Toowoomba said "Crops such as sorghum, mungbean, maize and cotton are highly dependent on a beneficial association with arbuscular mycorrhizal fungi (previously known as vesicular-arbuscular mycorrhizae or VAM) for uptake of nutrients such as phosphorus and zinc.

"These are aerobic fungi that require oxygen to survive. Paddocks that have been inundated for a number of days under warm conditions may result in reduced levels of arbuscular mycorrhizal fungi. As these fungi are concentrated in the top layers of the soil, any soil removal that may have occurred during the floods may also have a negative impact on fungi levels.

"The difficulty is that even though there may be adequate phosphorus and zinc in the soil, the plant may not be able to access these nutrients as efficiently. Higher than normal rates of starter fertilisers that contain P and Zn may therefore be of benefit to some crops this coming season," said Dr Seymour.

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Is safflower an option?

According to Moree East District Agronomist with NSWDPI Rebecca Byrne, seasons where some of the planned winter crop is not sown on timely rainfall, safflower could prove to be a good opportunity crop.

The later sowing window for safflower, from June through to August, allows growers to put in a crop where there otherwise would not have been one, due to the country being too wet or too dry to sow earlier. The later sowing and harvest dates have the added benefit of spreading machinery and labour workloads.

Another advantage of safflower is the low input requirements, as generally very little nutrition is needed and there are few insects or pests. While average yields are only around 1t/ha, being a niche crop, market prices are often high enough to compensate.

Safflower is an efficient break crop for winter cereals. It has different herbicide and weed management options, dries the soil profile and facilitates disease reduction through stubble break down and volunteer control. However, the impacts of safflower on root lesion nematode populations and crown rot have not been extensively researched.

Growers should be reminded that it is crucial that marketing contracts be arranged prior to sowing, as niche markets can easily become flooded leading to reduced market prices.

The 2010 GRDC publication 'Raising the bar with better safflower agronomy' has more detail on grower

experience and agronomic tips. It can be downloaded from: www.grdc.com.au - search for 'Better Safflower Agronomy'

Further information:

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Selecting for resistance – number of seasons or number of sprays? Some basics!

As the area affected by herbicide resistance increases, it's worth reflecting on why this is happening. In the main – it's about selection pressure and for weeds this equates to how many years a particular herbicide mode of action (MOA) has been used.

Using herbicides from the same MOA in multiple seasons will lead to much faster development of resistant weeds than use of multiple sprays of the same (MOA) in the one season – i.e. three seasons of use moves a population a lot more towards resistance than three sprays in the one season.

Each time a post emergent herbicide is used, the selection pressure is only applied to that percentage of the weed seedbank emerged at the time of spraying. If a weed has low seedbank dormancy and a high percent of the population is emerged when sprayed, a higher selection pressure for resistance results and the population moves towards resistance faster than would a weed with higher seedbank dormancy.

The number of years of selection pressure needed before a weed becomes resistant is based on maths and genetics. This is mainly about the frequency of the gene in the original unselected weed population, what percent of the population is killed by that herbicide and what percent of any surviving seed is allowed to enter the weed seedbank.

In the case of glyphosate, the frequency of resistance genes in unselected populations is very low and not dissimilar to levels of natural mutation (order of magnitude 1 in 1 billion). At the other end of the scale are Group A and B herbicides, with gene frequencies for Group A resistance typically around 1 in 250,000 to 500,000, with Group B resistance frequencies as high as 1 in 10,000.

Most advisers have multiple paddocks where Group B or Group A herbicides have been used for a long time and where resistance has not as yet led to failure. While several things can lead to this, the most common is that the grower has done something **in the same year as the selection pressure was applied** that has stopped or reduced the seed from survivors from entering the weed seedbank. When this is done the grower gets a free shot – a golfer's gimme for that herbicide.

How these issues equate to farming systems in the Northern Region is the subject of a series of GRDC supported one-day workshops on weed management for growers being coordinated by John Cameron of ICAN in association with regional weed experts.

Further information or to lodge an expression of interest:

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WeedSeeker® permit allows flexibility in NSW fallows

The APVMA have recently issued a permit that enables NSW growers to access a wider range of herbicides and rates in fallow when using a WeedSeeker and spraying less than 30% of the paddock area.

The thirty different herbicides listed on the permit offer great flexibility for managing hard to control fallow weeds.

The permit includes Group A herbicides for use in fallow – a practice that will select for Group A resistant species. The Permit contains warnings in relation to this and requires seed set management / follow-up treatment(s) to stop seed from surviving weeds from entering the weed seedbank. In practice, this will often mean a follow-up spray with paraquat or Spray.Seed®.

The permit is only applicable for use in NSW, is in force until 28 February 2015 and will be subject to annual reviews. The GRDC is working with key chemical companies, Crop Optics Australia, various government based research staff and grower solution groups toward the longer term goal of achieving label registration for most treatments.

Details of the permit can be accessed from the APVMA website at http://www.apvma.gov.au/permits/search.php and entering the permit number 11163.

Further information:

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2011 – a bad year for stored grain insects

The world may not end in 2011 as some suggest, but it has been a big year for insect pests in stored grain.

According to DEEDI stored grains specialist Philip Burrill, "the wetter than average seasonal conditions at harvest in 2010 and follow-up rain in many areas has seen much higher levels of insect activity in stored grain than has been seen for many a year. While there are increasing issues with insect resistance that require sealed storage to obtain an effective kill with phosphine, much of the increase in insect activity is due to wetter than average grain in storage.

"With increasing numbers of growers wanting to dry grain using aeration drying, the conditions have led to an increase in demand for auxiliary heaters for on farm drying silos.

"Auxiliary heaters work by heating the high flow rates of incoming air into a high flow rate drying silo - often by as little as 6 degrees. The slightly warmer and drier air that results is capable of removing a lot more water from grain through which it passes and achieves a much lower grain moisture equilibrium point than colder damper air.

Philip Burrill is currently leading a GRDC supported extension project that has the objective of improving grain quality and handling and profit outcomes through appropriate use of on-farm storage. In a smaller associated project for the CRC for National Plant Biosecurity, Mr Burrill is working with Andrew Ridley (DEEDI) and Chris Saunders (University of SA) to develop methods to measure actual aeration fan flow rates. As a lead into this work the team has tested the flow rates of several commercial aeration fans – both loaded and unloaded. The results while still preliminary are quite surprising. Mr Burrill hopes to have this data analysed and reported on in a session at the Clifton GRDC Grains Research Update on August 23rd.

A large range of factsheets and guides for managing on-farm storage can be found on the GRDC information hub web page at http://www.storedgrain.com.au/

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Dates for coming GRDC Updates for your diary

Update dates August 2011 and 2012 – Northern Region

August 2011

- 2-day summer crop Update – 8th and 9th August 2011, Goondiwindi Community Centre
- 3 Grower Updates Clifton (Tuesday 23rd August), Warra (Wednesday 24th August) and Spring Ridge (Wednesday 10th August)

February/March 2011

- Dubbo: RSL, March 1, 2012
- Goondiwindi Adviser Update: Community Centre, March 6-7, 2012
- 4 Grower Updates will also be run around this time, dates and times TBC

Further information:

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VISIT AUSTRALIA'S GRAINS RESEARCH WEB PAGE www.grdc.com.au

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