Summer 2015

giving a RATS

GRDC
Grains Research & Development Corporation

INTRODUCTION

Newsletter of :
"GRDC Project UA00124 – Understanding and management of resistance to Group M, Group L and Group I herbicides"

The Australian Glyphosate Sustainability working Group had its annual face-to-face meeting in Adelaide last August and discussed a range of topics critical to keeping glyphosate effective across a range of areas, not just broadacre cropping. The Group heard how the managers of South Australian roads are dealing with widespread glyphosate resistant weeds, which pose a safety hazard to drivers and threaten adjacent farmland. It looks like they are getting the upper hand which is great news. Also a senior viticulturalists with the Australian Wine Research Institute brought the group up to date with how the grape wine industry are managing glyphosate resistance across the highly variable wine regions of Australia. What was clear was that there is no one approach and each area uses different strategies to manage their weeds. While these presentations talk about diversity of management the Group also had discussions with companies about to introduce crop cultivars with "stacked" resistance traits. These are closely controlled and monitored in Australia and the aim of the discussions was to look at a standard approach to minimising resistance risk in weeds when using these technologies.

In this edition of Giving a RATS we discuss how ryegrass ergot has given southern Western Australian farmers an opportunity to figure out which of their herbicides is still effective before the plant the 2015 crop. With the widespread adoption of dry seeding this is an opportunity that should not be ignored.

After three years of research and plenty of media, Sally Peltzer from the Department of Agriculture & Food WA presents a summary of the research on how to keep those fence lines free of resistant weeds.

There is a lot of pressure on farmers to optimise their time when spraying so multiple mixes in the spray tank are one approach.This can become a nightmare if there is any incompatibility leading to poor weed control and blockages in the sprayer. Dow formulation chemist Rob Buttimor gives us some practical advice to avoid any stuff-ups.

In many parts of this great nation of ours the weeds are growing and robbing us of valuable soil moisture which can greatly affect sowing times and final winter crop yield. The GRDC has release a new publication which gives you all the information needed to get the best control of summer fallow weeds.

While on this topic it is useful to note that one company has put in the work and updated their fallow herbicide labels to include application using the Weedseeker™ and WeedIt™.

INDEX FOR THIS ISSUE

> ***There is no such uncertainty as a sure thing.***
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> *Robert Burns 1759 - 1796*

While rainfall totalling over 200 mm across parts of southern Western Australia in late spring created widespread ryegrass ergot problems at harvest it could provide a real boon for farmers. Strict grain receival standards limiting the amount of ergot forced many farmers to grade grain before delivery resulting in remnant heaps of weed seeds. The reason for strict standards is that ergot contamination of flour causes a horrible disease known in the Middle Ages as St Anthony's Fire.

If your post emergent herbicides don't work, you had better make sure you are seeding into weed-free paddocks.

Surveys in Western Australia over the past two years have shown over 40 per cent of paddocks tested have some level of glyphosate resistance.

This indicates we are close to a tipping point when glyphosate resistance is likely to start becoming obvious in cropping paddocks.

Figure 1. Seed grading to reduce ryegrass ergot in the grain sample, southern WA. Source: AGRONOMO

Ergot contamination of grain however presents growers with a valuable opportunity as many large heaps of ergot and weed seeds such as ryegrass, brome grass and wild radish sit in the corners of paddocks around their farms. These heaps give farmers a chance to test for herbicide susceptibility before the coming season.

Currently only a small percentage of growers test weeds for herbicide susceptibility and the gradings from ryegrass ergot presents them with a ready source of seed to see which of their herbicides still works. Surveys of agronomists and farmers have found that one of the reasons for low levels of testing is that growers are too busy to collect samples before or at harvest so this is a chance not to be missed.

Growers need to know which herbicides are still effective on their major weeds so testing your most commonly used herbicides is a good start. Further advice on which herbicides to get tested should be done with your adviser and the testing service that you plan to use.

If you are a fan of 'dry seeding', and many WA growers are, knowing if your herbicides still work is particularly important.

Figure 2. Ergot in cereal rye. Source: www.plantsincivilization.wordpress.com

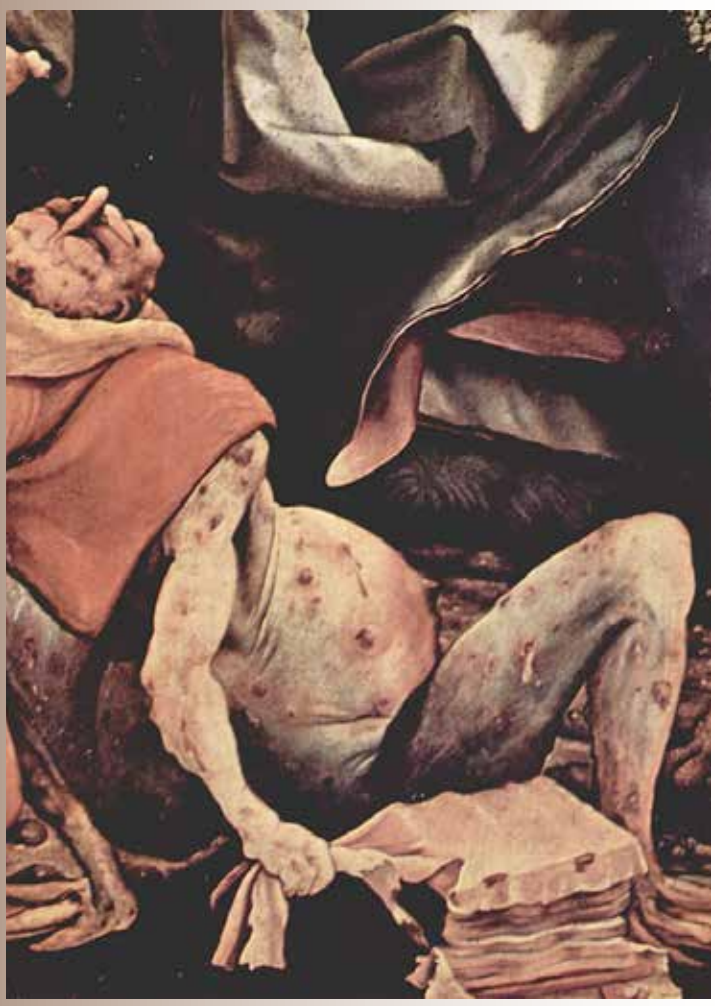

Figure 3. Part of the Isenheim Alter painted by Matthias Grunenwald circa 1512 showing a victim of St Anthony's fire – ergotism. Source Wikipedia

Knowledge is power, so now is the time to find out what you are dealing with.

The two weed seed testing services available in Australia are provided by Peter Boutsalis' Plant Science Consulting (PSC), in South Australia, and John Broster at Charles Sturt University (CSU), in NSW.

They take mature weed seeds collected during or after harvest, grow these out in controlled environments from December to February, treat the weed plants with the herbicide/s requested by the grower and then assess survival.

More information about these services is available at:

- ➔ Charles Sturt University
- ➔ Plantscience Consulting

It is recommended samples are sent before the end of January (in paper bags/envelopes - not plastic) so results are available before the beginning of the cropping season.

DAFWA ergot information
https://www.agric.wa.gov.au/mycrop/ergot

University of Nebraska ergot fact sheet
http://ianrpubs.unl.edu/live/ec1880/build/ec1880.pdf

A History of Saint Anthony's Fire

On 15 August 1951 one in twenty of the 4000 inhabitants of another village in France called Pont Saint Esprit (Bridge of the Holy Spirit) went mad. They had hallucinations, writhed in agony in their beds, vomited, ran through the streets and suffered terrible burning sensations in their limbs.

They were suffering from St Anthony's Fire, a dreaded illness that was common in the Middle Ages. The cause was poisoning from rye ergot, a fungus that contaminated the rye flour used in making bread.

In the Middle Ages, the gangrenous poisoning was known as "holy fire" or "Saint Anthony's fire", named after monks of the Order of St. Anthony who used to treat this ailment along with 'the plague'.

Ergot contains a chemical that gives the sufferers hallucinations and causes gangrene of the hands and feet due to constriction of blood supply to the extremities. If it is not treated victims had the sensation of being burned at the stake, before their fingers, toes, hands and feet dropped off.

Ergotism

Ergot contains ergotamine. In moderate doses, ergotamine causes the contraction of smooth muscle fibres, such as those in small arteries. Ergotamine has been used to control haemorrhage (bleeding) and to promote contraction of the uterus during childbirth. It is also used to treat migraine headaches (its major use today).

In large doses, ergotamine paralyses the motor nerve endings of the sympathetic nervous system. The disease ergotism (St. Anthony's fire) is caused by excessive intake of ergot, usually by eating baked goods made with contaminated flour, as happened in the Middle Ages. Acute and chronic ergotism are characterized by mental disorientation, convulsions, muscle cramps, and dry gangrene of the extremities.

DON'T FENCE ME IN - THREE YEARS OF FENCE LINE TRIALS IN WESTERN AUSTRALIA

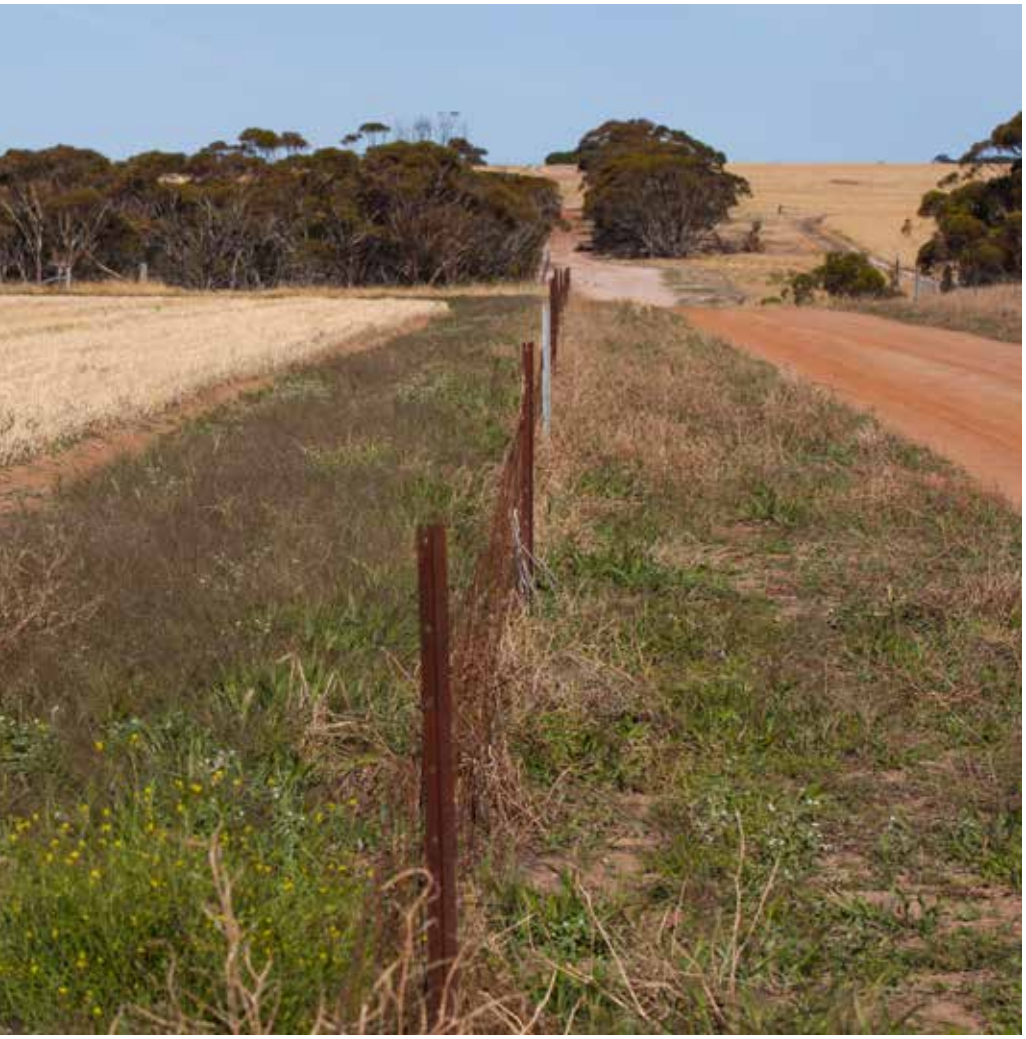

Figure 4. Remnant wild radsish and summer weeds taking over fence line near Lake Grace. Source: AGRONOMO

KEY MESSAGES

- ➔ A two spray or 'double knock' strategy (including cultivation or another non-herbicide treatment) is often required for complete weed control along fences with the first treatment early in the season followed by another one later in the season (after the seeding and post-harvest operations are over).
- ➔ Tank mixes of a residual herbicide plus a knockdown give the best control for the first application.
- ➔ A single application of a mixture of bromacil (Uragan®) plus paraquat early in the season gives excellent weed control along fences.
- ➔ The addition of amitrole + paraquat (Alliance®) as the knockdown gives good broadleaf weed control.
- ➔ Glyphosate can still be used BUT intensive monitoring and complete seed set is required to prevent resistance from developing.

Fences can be a 'breeding' ground for glyphosate resistance due to the lack of crop competition, its repeated usage and the often late applications when weeds are large and harder to control. Controlling weeds that grow along fences is important to prevent their move into cropping fields taking their resistance status with them.

For the past three years, the Northern and Esperance Advisor Groups (set up as part of the GRDC-funded herbicide resistance project UA00124) have looked at annual ryegrass and other weed control in fence lines for resistance management.

In 2012, the two groups compared 13 herbicide treatments (applied as either single herbicides (glyphosate, paraquat, amitrole, glufosinate or amitrole + paraquat) or as a mixture of a residual herbicide with paraquat) with glyphosate at two trial sites (Esperance and Dalwallinu).

- ➔ Tank mixes of residual herbicides plus either paraquat or amitrole + paraquat gave the best control of annual ryegrass, wild radish and other grasses and broadleaf weeds.
- ➔ Applications of bromacil offered the best control at both locations.
- ➔ The herbicide treatments were applied in August which tends to be a common time for many growers. In August however the weeds are often large and harder to control.

In 2013, two earlier (but single) application times (May and early July) of a further range of herbicides were explored in four locations, Miling, Dandaragan, Geraldton and South Stirlings.

- ➔ Similarly, tank mixes of residual herbicides plus a knockdown gave the best control.
- ➔ No treatment gave complete control.

In 2014, the groups decided that two control timings were needed, once early in the year with a good residual and a knockdown, followed by another one later in the season (after the seeding and post-harvest operations are over). That way you set up the fencelines early in the season then kill them off later rather than having to spray big fat weeds in in one pass. As bromacil was now registered for fence lines (Uragan® is the only product registered for fences), it was included as a single application mixed with paraquat at the early timing.

Cultivation and slashing were also included in some of the treatments.

- A single application of bromacil plus paraquat in May (or June in Esperance) gave complete control of all weeds (annual ryegrass, wild radish, mallow, capeweed, turnip, clover, volunteer cereals) at all sites with both rates (3.5 and 5 kg/ha).
- Bromacil seems expensive but only one application is needed to control all weeds (including summer weeds) for at least one year. As bromacil is highly residual, there is a risk of soil erosion where there is no vegetation to hold onto it and a risk to the crop if soil is blown onto it. It is toxic to trees so can only be used where there is no remnant vegetation.
- At most locations an application of either simazine plus amitrole + paraquat or simazine, 2,4-D and paraquat in May followed by a second application of atrazine plus paraquat in August gave over 95 per cent control. The addition of amitrole + paraquat gave slightly better control where there were broadleaf weeds (three years results).
- Delaying the application of the first spray reduced the control by 10 to 30 per cent across all sites.
- Slashing later in the season then spraying with atrazine and paraquat showed promise in the southern areas (80-98 per cent control) where the season was later and there had been more rain. There was poor control (56-59 per cent) in the northern trial sites.
- The use of cultivation as a control option did not work well in this series of trials due to the wet spring.

Figure 5. Sally Peltzer discussing the benefits of bromacil as a fence treatment at Stirlings2Coast Field Day, 2014. Source: AGRONOMO

Sally Peltzer

DAFWA Albany

Figure 6. Sally Peltzer with East Wagin group in October 2014 discussing why a single winter application of paraquat + simazine was ineffective. Source: AGRONOMO

GET THE MIX RIGHT OR REGRET IT AT YOUR LEISURE

With growers trying to reduce the number of spray passes on a paddock there is a great temptation to start mixing multiple products in the one tank, often with five or six products, which can include two or three herbicides, an insecticide and some form of adjuvant.

To add further complexity to the scenario, the wide variation in the quality of water being used also plays a significant role in tank mix success. A recent round of "Better Spray Application" workshops highlighted the fact that many growers do not have a good understanding of their water quality.

Figure 7. Rob Buttimor, Dow Agrosciences, checking the pH and hardness of the Tasman Sea. Source: R Buttimor

Add to this the fact that there are over 300 branded adjuvant products on the Australian market with 30 different active ingredients, it is no wonder agronomists and farmers can get into trouble.

Reading the herbicide label usually gives a good indication of what the company considers as compatible with their product although this information might sometimes not be as detailed as the user would desire.

An excellent resource is Table 33 in NSW Department of Primary Industries' "Weed Control in Winter Crops 2014" which looks at a wide range of pesticide compatibilities.

The pesticide user needs to remember a pesticide active ingredient has to be formulated to be:

- As biologically effective as possible in controlling the pest/weed/disease
- Physically and chemically stable in storage (minimum of 2 years)
- Easy to mix
- Compatible with other pesticides
- Stable as a spray solution

To achieve these qualities a range of other chemicals are mixed with the active ingredient and these are known as 'inerts'. These 'inerts' include:

- Buffers
- Dispersants
- De-foamers
- Solvents
- Emulsifiers
- Dyes

Another complication is that formulations for the same active ingredient usually vary from manufacturer to manufacturer. The 'inert' ingredients will also vary in quantity and quality.

As this can be complicated we asked Rob Buttimor, a Formulation Chemist with Dow Agrosciences for a few tips about chemical compatibility and how we can assess what mixes work.

It might sound trite, but read the label: there is a lot of good information on spray volumes and compatibility to be found.

The major factors that cause spray tank incompatibility include:

- Spray volumes - higher spray volumes tend to have fewer problems as there is 'more room' in the solution for the various components. i.e. the more concentrated the solution/brew is the higher propensity for chemical reactions to occur
- The greater the variety of formulations (formulation type and active type) added to the spray tank, the greater the chance of problems, such as the active coming out of solution and becoming ineffectual.
- pH – This is only a problem in extreme cases (i.e. when the pH is above 8). In most typical scenarios glyphosate adjusts the pH to the correct level due to its chemical nature, so it is encouraged that you test your spray mix pH after the glyphosate is added, not your "water" pH. Acidifiers (such as LI-700®) are only required in extreme cases, unless they are being used for another purpose, in which case the pH effect on the brew needs to be considered
- Hardness – Metal ions such as calcium and magnesium can be problematic, chemically binding/reacting with the active in the spay mix. This can result in physical incompatibilities such as gelling. High levels of bicarbonate can also affect Group A herbicides and 2,4-D amine. Avoid brackish water and ensure you test bore water for hardness before using. Rain water is always the best bet to avoid any hardness issues.

With soluble liquids (SL) the amine salt used in the formulation (such as dimethylamine, isopropylamine, etc..) will dictate the compatibility of the formulation with other products and water quality. Some companies will add conditioners to their formulations to improve the compatibility. Suspension concentrates (SC) generally mix well with all water and other formulations.

In general, follow the correct mixing order, give lots of spray volume and try a jar test.

How to conduct a jar test:

- In a 500 mL jar mix the same ratio of chemicals with the same water at the same temperature and let it sit for 5 hours.
- Look carefully for crystals that would cause spray filter blockages.
- Look for oil or general glug - a slight cream is not a problem.
- Remember, a small amount of problem in the jar can mean big problems in the tank!

Follow the proper mixing order (general guidelines below, but read the label to verify):

- Fill tank two thirds with clean water, turn on agitation. Make sure there is lots of room for the formulations to dilute.
- Add water conditioners such as ammonium sulphate or EDTA (edatic acid). This covers up hard water ions that may cause incompatibility issues.
- Add granules / flowables / powders and mix well. These take time to mix in so don't rush it.
- Add emulsifiable concentrates and crop oils before soluble liquids, this allows the emulsion to set up first. Add soluble liquids, such as glyphosate - the ions added at this stage are less likely to interfere with the emulsification.
- Add wetters (e.g. BS-1000). These are surfactants and have to be added after emulsifiable concentrates have formed an emulsion. Adding these at the end also results in less foaming.
- Top up with water to final spray volume.

Figure 8. Ooooops! A combination of hard water, acidification and low spray volumes! Source: R. Buttimor

Figure 9. Who would want a truck load of this? Source: R. Buttimor

For more information:

GRDC Spray water quality Fact Sheet - http://www.grdc.com.au/GRDC-FS-SprayWaterQuality

GRDC Mixing Requirements for spray operations Fact Sheet - http://www.grdc.com.au/GRDC-FS-SprayMixRequirements

STUBBLES FULL OF WEEDS AFTER SPRING AND SUMMER RAINS

Heavy spring rains in some parts of the cropping belt and now rains during January in other areas have created a significant summer weed problem for many growers including fleabane (*Conyza spp*.), sowthistle (*Sonchus* spp.), melons (*Cucumis* spp. & *Citrullus* spp.), common heliotrope (*Heliotropium europaeum*), caltrop (*Tribulus terrestris*) and various annual grass species.

Reports have also been received of annual ryegrass germinating in western Victoria over the past few weeks although much of this is likely to die with the return of hot weather.

A great deal of research across Australia has shown significant benefits to keeping weeds controlled over the summer fallow, including the GRDC Southern and Western regions. Benefits include higher yields in below average rainfall winters as well as the ability to establish crops earlier with less autumn rain. This is becoming more important as winter rains become less reliable.

A new reference manual Summer Fallow Weed Management, published by the Grains Research and Development Corporation (GRDC), demonstrates how growers can reap a high return on investment from managing summer weeds. The publication was co-authored by Andrew Storrie, of AGRONOMO, and John Cameron, of ICAN Pty Ltd.

This publication covers all aspects of summer fallow management from the benefits through to what to use.

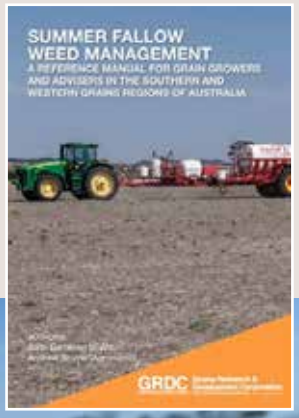

Figure 11. Click to see entire booklet.

Figure 10. Fleabane and sowthistle just after harvest and ready for spraying. Source: AGRONOMO

OPTICAL SPOT SPRAY TECHNOLOGY ADDED TO LABELS

With the adoption of optical spot spray technology (OSST), using either WeedIT® and WeedSeeker®, on many farms across Australia, Nufarm has added OSST as a new registration to many of its fallow products including paraquat, 2,4-D, 2,4-D + picloram, amitrole and fluroxypyr.

Researching the use of fallow herbicide products with OSST's by Nufarm began in 2008 after Andrew Storrie, then Technical Specialist Weeds with NSW Department of Primary Industries, began discussions in 2007 with Crop Optics and the various chemical companies to develop a permit to cover the use of this application technology .

The discussions and a lot of hard work by Tony Cook, NSW DPI, eventually lead to the issuing of APVMA Permit PER11163 .

Like the permit, the Nufarm registrations are designed to control weed cover up to 30 per cent of the field. If the percentage of weed cover exceeds 30 per cent, growers should use approved broadacre boom spray rates.

OSST allows growers to apply higher rates to achieve good control of larger difficult to control weeds such as fleabane, sowthistle, melons, windmill grass, feathertop Rhodes grass and barnyard grass, as well as glyphosate resistant escapes.

Because up to 30 per cent of the paddock is being sprayed, it makes the higher rates being applied cost effective.

While OSST is great for these hard to control weeds, only young, actively growing weeds should be sprayed.

Figure 12. Weedseeker™ in action. Source: Crop Optics

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