

# Double-knock down to protect glyphosate – do it soon

Modelling done by researcher David Thornby of Queensland Primary Industries and Fisheries, (part of DEEDI) predicts that the earlier and more frequently the double-knock tactic is used in a weed management system, the slower the evolution of glyphosate resistance will be.

Double-knock is the sequential application of two control options where the second option is designed to control the survivors of the first with a short time period between the two tactics. Examples include one herbicide followed by another herbicide, a herbicide followed by tillage or full cut seeding.

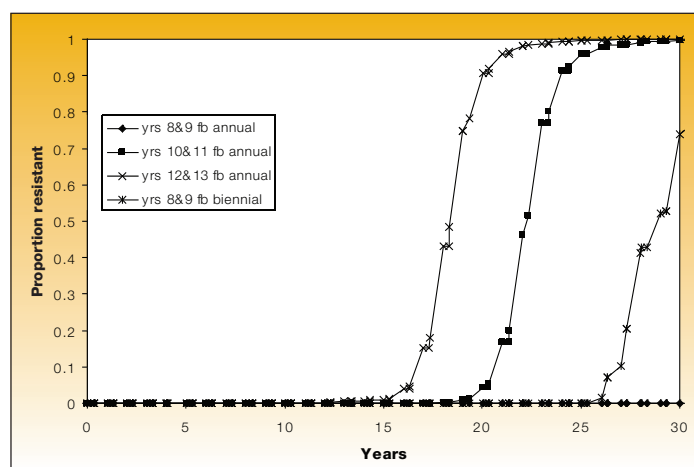
Dr Thornby said “A key message from the modelling is the importance of starting with double-knock as soon as possible. The sooner you start, the more effective it is as a tactic for slowing glyphosate resistance development.”

In a set of simulations, Dr Thornby considered a two-year double-knock intervention strategy – ie performing a double-knock (consisting of glyphosate followed by an alternative knockdown herbicide) on every flush of barnyard grass that appeared for two consecutive years after several years of high risk practices (either years 8 and 9, 10 and 11 or 12 and 13), then following up with a double-knock on one large flush every year or every second year afterwards (figure 1).

The modelling showed that the earlier the double-knock intervention occurred, the greater its overall benefit and if the intervention was soon enough (after no more than 7 years of high risk practices) the model showed glyphosate resistance was likely to be avoided altogether within the 30 years of simulation. Even where glyphosate resistance still occurs, the model predicts that annual double-knocks on one large flush will keep the population at lower levels (figure 2).

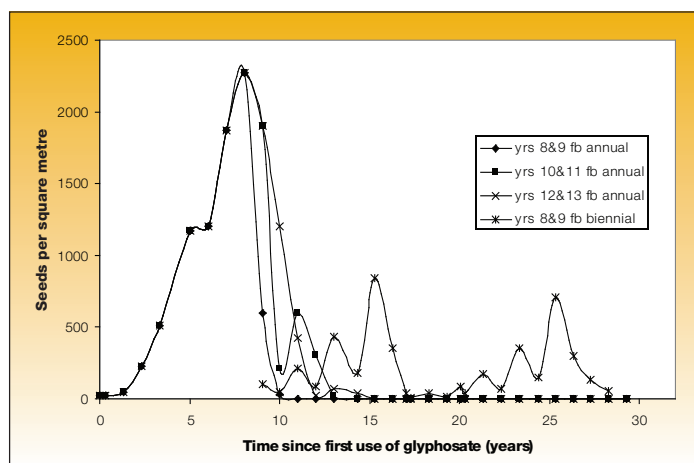
“Once you can see the problem in the paddock, it may be too late to fix it, so it is important to start now. An intensive program of double-knocks over two years, followed by annual or biennial double-knocks on one flush of weeds per year can delay the onset of glyphosate resistance and drive down seedbanks to manageable levels” said Dr Thornby.

Other simulations show that if a farmer has been using double-knock from the start of minimum or no-till farming, using a double-knock twice in every five years could be enough to sustain glyphosate usefulness for more than 30 years.



**Figure 1: The impact of the double-knock tactic on barnyard grass (*E. colona*) resistance proportion**

**Two year intensive programs followed by annual or biennial double-knock follow up thereafter**



**Figure 2: Impact of double-knock on barnyard grass (*E. colona*) seedbank density**

**Two-year intensive double-knock program plus annual or biennial double-knock follow-up thereafter**

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**GRDC codes: DAQ00079, DAQ00136**

# Successful grain storage needs attention to detail

With increasing levels of grain being stored on-farm and zero tolerance for live storage pests in grain sold off-farm, growers need a planned, integrated approach to pest control.

“Tools that assist in keeping grain insect free include; good hygiene, aeration cooling, monthly monitoring for early identification of pest incursions, selecting the correct storage treatments; and applying stored grain treatments correctly,” said Mr Phil Burrill, Grain storage specialist with QPI&F (DEEDI).

“The combination of good hygiene and well-managed aeration cooling can often be adequate, but often fumigation or the use of a grain treatment is also required.

“When fumigation is needed, it must be done in a pressure-tested sealable silo. For effective phosphine fumigation, a minimum of 300 parts per million (ppm) gas concentration for seven days or 200ppm for 10 days is required. (See note below). Gas will leak out very quickly from unsealed storages, resulting in poor insect control at all life-cycle stages (eggs, larvae, pupae and adults). Frequent use of poor fumigation practice also increase the populations of resistant insects,” said Mr Burrill.

“The first grain harvested is often at the greatest risk of early infestation due to contamination from harvest and handling equipment. One on-farm test found over 1000 lesser grain borers in the first 40 litres of wheat that passed through the harvester. Before harvest, grain residues should be cleaned from storage and grain handling equipment, including harvesters, field bins, augers and silos.

“Freshly harvested grain usually has a temperature around 30°C, which is an ideal breeding temperature for storage pests. Aeration fans fitted to stores can rapidly reduce grain temperatures. Studies have shown that temperatures below 23° in summer and 15°C in winter are achievable. These temperatures respectively slow or stop insects breeding. Aerate grain to cool it as soon as it is placed into storage. Using an automatic controller to run fans can have significant benefits in selecting air of the right quality to cool the grain.

“Grain should be monitored and sieved for the presence of insects at least monthly. Grain temperature and moisture should be checked at the same time. Sieve a half litre sample onto a white tray. Hold tray out in sunlight to warm for 20 to 30 seconds to encourage insect movement. Samples should be collected from the top and the bottom of the silo,” said Mr Burrill.

More information is available in the Stored Grain Pests Northern and Southern region Fact Sheet at [www.grdc.com.au/factsheets](http://www.grdc.com.au/factsheets)

**Note:** High level resistance to phosphine in flat grain beetle has been identified. If fumigation with phosphine fails to kill this insect, please contact Phillip Burrill.

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## TSV & sunflower varieties for CQ

With tobacco streak virus (TSV) causing losses of up to 60 per cent in sunflower crops across parts of Central Queensland, affected growers are urged to consider varietal tolerance to TSV when selecting which hybrid to grow.

Trials to identify tolerance levels have been carried out in recent years by Mr Murray Sharman from Queensland Primary Industries and Fisheries (QPI&F) with funding from the Grains Research and Development Corporation (GRDC).

Mr Sharman said “the incidence of infection ranged from around five per cent of the crop to more than 80 per cent in different varieties (Figure 3).

“Tolerance to TSV is just one factor to consider in variety selection, along with yield potential, performance under local conditions, and oil levels – but in Central Queensland it’s become a factor that shouldn’t be ignored,” Dr Sharman said.

Two seasons of field trials were conducted in the Clermont region in early 2008 and early 2009. Trial sites were selected to be downwind of infestations of TSV-infected parthenium and have a history of high TSV disease levels in commercial sunflower crops. There were three sites in total, one in 2008 (Kenlogan), then two in 2009 (one each at Kenlogan and Langton Cottage). Fifteen hybrids from three seed companies were tested in 2008. These were again tested in the 2009 trials along with 6 additional hybrids. Each hybrid was grown under equal conditions (which may not be optimal conditions for each particular hybrid).

At 2 months post planting, the trials were rated for any symptoms that would prevent harvesting, e.g. death, stem necrosis leading to lodging and heads severely reduced in size and/or deformed. There was higher incidence of TSV at the Kenlogan sites in both 2008 and 2009 compared to Langton Cottage 2009. There were also differences in soil moisture between the sites which may cause variation in the response of the hybrids to infection and the severity of infection.

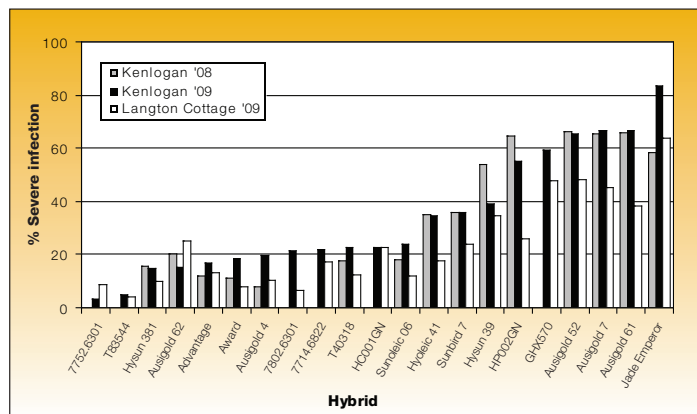
The results shown in Figure 3 only consider differences between hybrids in their tolerance to TSV infection. Yield and agronomic factors that contribute to the performance of hybrids need to be considered when selecting hybrids along with the risk of severe disease due to TSV.

The highest rates of TSV disease incidence generally occurred downwind of large areas of TSV-infected parthenium. Avoiding plantings downwind of large areas of TSV-infected parthenium is one effective way to avoid very high disease incidence near the crop edge.

Preliminary results from QPI&F research indicates that a barrier crop of forage sorghum may also help to reduce the severe edge effect. For example, in one situation, a barrier of 8m of sorghum, planted at the same time as sunflowers,

appeared to reduce TSV disease incidence to 33% compared to about 75% without a barrier.

TSV has not yet been detected in sunflower crops outside of Central Queensland. As such, the results presented here for tolerance of sunflower hybrids to TSV infection are currently only relevant to regions that have been, or are at risk of being impacted by TSV.



**Figure 3. Three field trials assessing incidence of severe TSV disease at 2 months post planting in different sunflower hybrids. Least significant difference (L.S.D.) = 11% for Kenlogan 2008, 14% for Kenlogan 2009 and 20% for Langton Cottage 2009. Any differences between cultivars which was greater than the L.S.D. were significant at the  $p < 0.05$  level.**

Details of the TSV tolerance trials are outlined in the latest edition of Cropping Central (Issue 44) from the Central Queensland Sustainable Farming Systems Project.

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## Raising the bar on sunflower

A new booklet from the GRDC and Australian Oilseed Federation, titled 'Raising the bar with better sunflower agronomy' contains grower case studies and results from demonstration sites throughout Northern New South Wales and Central Queensland. It is available by calling Ground Cover Direct on 1800 11 00 44.

## Nitrogen book and nitrogen fertiliser calculator on CD

A new book on soil nitrogen covers the management of declining soil fertility and the need for nitrogen to maintain crop yield.

"The Nitrogen Book" compiled by Howard Cox of QPI&F and the Central and Southern Queensland Sustainable Farming

Systems Projects is a compilation of current research and farmer knowledge on soil nitrogen management. The resource assists farmers and agronomists to understand and manage soil nitrogen fertility in the farming systems of central and southern Queensland. In addition to decisions on nitrogen fertiliser and its application, the book also covers gains and losses of nitrogen in the soil. A chapter on suitable pasture species is also included.

The book is supported by data from the WhopperCropper climate risk management decision support tool.

WhopperCropper output is also used in the production of an easy-to-use calculator 'Smart N Decisions' which is supplied on CD. Climate risk analysis has been incorporated into nitrogen fertiliser decisions and this represents the main advance in nitrogen fertiliser management compared to the previous 'budgeting' method. The N fertiliser calculation involves targeting a 'season type' rather than a 'target yield'. The optimum N fertiliser rate is found by finding the optimum gross margin in response to selectable amounts of applied N. The gross margin outcomes for seasons that are different from the one targeted are also immediately available – providing significant information on the risk and reward of alternate strategies and outcomes.

The calculator shows the effect of stored soil water and in-crop rainfall on crop demand for nitrogen and response to applied nitrogen. This reinforces the benefits of measuring stored soil water and nitrogen.

The book and calculator were created with funding from the Grains Research and Development Corporation within the Central and Southern Queensland Farming Systems Projects.

Orders for the free CD can be made via the QPI&F Business Information Centre 13 25 23 or email [callweb@dpi.qld.gov.au](mailto:callweb@dpi.qld.gov.au).

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## February/March Northern Grains Research Updates

Dates are set for the February/March 2010 Grains Research Updates in the north. Add these details to your diary! More details soon.

Location	Date	Target audience*
Wellington	22nd Feb 2010	Growers
Nyngan	23rd Feb 2010	Growers
Dubbo	24th Feb 2010	Advisers
Gunnedah	25th Feb 2010	Growers
Moonie	1st March 2010	Growers
Mungindi	2nd March 2010	Growers
Goondiwindi	3rd & 4th March 2010	Advisers

\* Note Growers welcome to attend Updates targeted to advisers & visa versa

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 GRDC code: ICN00011

# Add your event details to GRDC diary dates on-line

If you are running a field day, workshop, seminar, farm walk or other event of interest to grain producers or advisers, log on to the GRDC's website and add your event details to GRDC Diary Dates on-line.

To add new events, go to: <http://www.grdc.com.au/director/events/diarydates/Adddiarydate>

To see what's on, go to: <http://www.grdc.com.au/director/events/diarydates/>

February 10	
16-17	<b>GRDC Adviser Update, Southern Region</b> - Wagga Wagga, NSW <i>Contact: Matt McCarthy, 03 5441 6176</i>
23-24	<b>GRDC Adviser Update, Southern Region</b> - Ballarat, Vic <i>Contact: Matt McCarthy, 03 5441 6176</i>
22	<b>GRDC Grower Update, Northern Region</b> - Wellington, NSW *
23	<b>GRDC Grower Update, Northern Region</b> - Nyngan, NSW*
24	<b>GRDC Adviser Update, Northern Region</b> - Dubbo, NSW *
25	<b>GRDC Grower Update, Northern Region</b> - Gunnedah, NSW *
28 Feb - 3 Mar	<b>Global Biosecurity 2010: safeguarding agriculture and the environment</b> Location: Brisbane Convention and Exhibition Centre, Qld <i>Further information: <a href="http://www.globalbiosecurity2010.com">www.globalbiosecurity2010.com</a></i>
March 10	
1	<b>GRDC Grower Update, Northern Region</b> - Moonie, Qld *
2	<b>GRDC Grower Update, Northern Region</b> - Mungindi, NSW*
3-4	<b>GRDC Adviser Update, Northern Region</b> - Goondiwindi, Qld*
3-4	<b>GRDC Adviser Update, Southern Region</b> - Adelaide, SA <i>Contact: Matt McCarthy, 03 5441 6176</i>
15	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Gulargambone, NSW*
16	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Gunnedah, NSW*
17	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - North Star, NSW*
18	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Dalby, NSW*
22	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Parkes, NSW*
23	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - West Wyalong, NSW*
24	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Griffith, NSW*
25	<b>Integrated Weed Management (IWM) one-day workshop for growers</b> - Deniliquin, NSW*
April 10	
13-15	<b>2010 Australasian Milling Conference</b> - Melbourne, Vic <i>Contact: Graeme Lukey, 03 9819 1433</i>
May 10	
1-4	<b>CICILS IPTIC International Pulse convention</b> - Brisbane Qld <i>Contact: Pulse Australia, <a href="http://www.pulseaus.com.au">http://www.pulseaus.com.au</a></i>
June 10	
21-24	<b>Australian Summer Grains Conference (ASGC)</b> - RACV Royal Pines, Gold Coast, QLD <i>Contact &amp; Further Information: Kate: <a href="mailto:asgc10@yrd.com.au">asgc10@yrd.com.au</a></i>

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