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

GRDC
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New thresholds for *Helicoverpa* in mungbeans

The economic threshold for managing *Helicoverpa* in mungbeans is now much more clearly defined than the old practice of spraying if larvae at flowering / podding was ~ 1 larvae/m^2. For a typical crop, aerially-sprayed with control costs (pesticide + application) of $40/ha and a crop value of $600/t, the new "break-even" threshold is 1.9 larvae/m^2, i.e. nearly double the old threshold.

Threshold values for different control cost and crop value scenarios are presented below in Table 1. These conservatively apply to all crop stages from budding to late pod fill. DPI entomologist Hugh Brier, said that "the data suggests mungbeans can compensate for moderate early *Helicoverpa* damage, but that early damage, particularly at early budding, can delay harvest maturity – particularly in smaller, drought-stressed crops."

"The new threshold will reduce many uneconomic sprays and save growers money. Spraying only when it is economically viable and avoiding unnecessary spraying will also reduce the risk of *Helicoverpa armigera* developing resistance to the newer more selective and IPM-friendly pesticides indoxacarb and spinosad".

Further trials are planned to investigate the impact of early damage at different *Helicoverpa* densities and under different watering regimes. If low populations at budding/flowering are shown have no or little impact on yield or time to harvest in well grown mungbeans crops, then growers could reserve products such as indoxacarb for the more susceptible podfill stage, or use a biopesticide such as *Helicoverpa* NPV.

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Project code: DAQ00086

Table 1: Break-even economic threshold table for *Helicoverpa* in flowering/podding mungbeans

Cost of control = Value of damage ($/ha)	Thresholds (larvae/m^2) for conventional pesticides at mungbean crop values listed below ($/t)									
	$350	**$400**	**$450**	**$500**	**$550**	**$600**	**$650**	**$700**	**$750**	**$800**
$20	1.6	1.4	1.3	1.1	1.0	1.0	0.9	0.8	0.8	0.7
$25	2.0	1.8	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9
$30	2.4	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.1
$35	2.9	2.5	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.3
$40	3.3	2.9	2.5	2.3	2.1	1.9	1.8	1.6	1.5	1.4
$45	3.7	3.2	2.9	2.6	2.3	2.1	2.0	1.8	1.7	1.6
$50	4.1	3.6	3.2	2.9	2.6	2.4	2.2	2.0	1.9	1.8
$55	4.5	3.9	3.5	3.1	2.9	2.6	2.4	2.2	2.1	2.0
$60	4.9	4.3	3.8	3.4	3.1	2.9	2.6	2.4	2.3	2.1
$65	5.3	4.6	4.1	3.7	3.4	3.1	2.9	2.7	2.5	2.3

Note that the threshold represents the break even point, i.e. Benefit / Cost Ratio=1

To apply a Benefit: Cost Ratio >1, increase the cost of control by an amount you are comfortable with.
For example, at a cost of control of $40/ha and crop value of $600/t, the break even point population is 1.9 larvae/m^2.
If you are happy to not take action until another $10/ha damage is inflicted, the action threshold is 2.4 larvae/m^2.

Rutherglen bugs – on the threshold?

According to entomologist Melina Miles from the Department of Primary Industries & Fisheries (Qld), "the management of Rutherglen bug (*Nysius vinitor*) (RGB) has emerged as a concern for growers and agronomists in the past 2-3 seasons in sorghum. Part of the concern was that it was often unclear if the RGB were causing sufficient crop loss to warrant control measures and until recently, there had been only limited research on RGB damage potential in sorghum," said Dr Miles.

"Typically RGB are found in sorghum crops in large numbers prior to desiccation or harvest. However, in 2007-08, early flowering sorghum was infested at flowering, resulting in significant reductions in seed set and consequently yield. Whilst this type of damage had been seen previously in trials, it had not been seen before in the field. This experience underpins the need for monitoring of RGB from head emergence until the crop reaches the hard dough seed stage.

"Current recommendations for RGB in sorghum are based on trials that have examined the impact of different populations on sorghum at different stages of head maturity. Current data suggests that flowering-milky dough stages are most susceptible to RGB and that the potential for yield loss reduces as the grain fills and matures. The data we have is still preliminary and needs further validation in the field," said Dr Miles.

Until more refined thresholds are determined, Dr Miles suggests a working threshold of 20-25 bugs/head during the flowering-milky stages and 30-50 bugs/head at soft dough stage. No yield loss occurs with infestations post physiological maturity (black layer).

"While synthetic pyrethroids have shown useful efficacy in controlling populations of RGB, some cannot be used as they do not have known MRL's and export slaughter intervals. Also there is no specific registration for RGB on the label for most products. As synthetic pyrethroids kill populations of beneficial insects, they pose a significant threat to the management of *Helicoverpa* and aphids in sorghum so should only be used when absolutely necessary.

"Samples of grain from heads infested with different densities of RGB have been analysed by NIR for changes in grain quality. The only key parameter that changed in the samples was a reduction in starch content as RGB density increased above 100 bugs per head at the milky dough stage. The implication of this result needs to be explored further in relation to feed quality traits and possibly ethanol production," said Dr Miles.

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Sorghum desiccation water savings confirmed

With most growers spraying glyphosate on grain sorghum prior to harvest to both save soil moisture for the next crop and as a harvest aid, NSW DPI researcher Guy McMullen working with Northern Growers Alliance thought it would be prudent to revisit the impact of timing of sorghum desiccation on grain yield, quality and amount of soil water stored.

Table 1: Impact of desiccation timing on grain yield and quality at Wandobah

Timing	Grain Moisture	Yield (t/ha)	Protein (%)	Hectolitre (kg/hL)	Screenings (%)	Grain Size (g/1000)
1	48	4.09 c	9.73 b	77.2 a	6.4 a	23.0 b
2	38	5.37 b	9.04 a	79.0 b	2.8 b	26.3 a
3	33	6.25 a	8.87 a	79.4 b	2.0 b	27.3 a
4	29	6.31 a	8.80 a	79.6 b	1.8 b	28.1 a
5	25	6.59 a	8.77 a	79.0 b	2.1 b	27.8 a
cv%		4.1	1.4	0.4	13.8	1.5
5% lsd		0.73	0.41	3.5	1.3	1.78

Means followed by the same letter within columns are not significantly different

Table 2: Impact of desiccation timing on grain yield and quality at Pine Ridge

Timing	Grain Moisture	Yield (t/ha)	Protein (%)	Hectolitre (kg/hL)	Screenings (%)	Grain Size (g/1000)
1	27	9.31	8.57	405	4.0	31.3
2	22	10.61	8.60	395	4.7	32.3
3	18	10.40	8.56	411	4.6	32.2
4	16	9.98	8.59	396	5.4	32.7
5	12	9.79	8.64	405	4.8	31.7
cv%		2.6	2.1	2.0	13.9	2.8
5% lsd		nsd*	nsd	nsd	nsd	nsd

nsd = no significant difference

Table 3: Soil water (mm) relative to the last desiccation timing at Wandobah

Soil Depth (cm)	Desiccation Timing 1	2	3	4
0-30	1.7	-0.4	-0.1	0.5
30-60	0.8	6.8	-1.5	0.4
60-90	3.6	11.8	2.2	1.2
90-120	10.4	14.1	6.7	-1.8
120-150	-0.8	-0.6	-0.9	-6.0
TOTAL	15.7	31.6	6.3	-5.7

Table 4: Soil water (mm) relative to the last desiccation timing at Pine Ridge

Soil Depth (cm)	Desiccation Timing 1	2	3	4
0-30	3.6	2.7	4.0	3.7
30-60	2.4	2.1	0.4	1.5
60-90	2.8	-1.5	-2.0	-1.9
90-120	5.0	1.8	3.2	-1.3
120-150	6.0	6.1	5.2	0.9
TOTAL	19.8	11.1	10.7	2.9

Results confirmed the safety to crop yield and grain quality when applied at grain moistures below 25%, and showed that a well timed pre-harvest spray can save significant amounts of very valuable deep soil moisture!

Two small plot trials on the Liverpool Plains were sprayed at several times, with the first at about 4 weeks before commercially planned desiccation. At Pine Ridge the sorghum variety was MR Buster sown on 75 cm rows while at Wandobah MR43 was sown on 1 m rows.

At Wandobah, where desiccation commenced at higher grain moisture, the two earliest desiccation timings reduced yield by, 38% and 19%.

Only the earliest desiccation substantially influenced grain quality, with protein, hectolitre weights, screenings and grain size all significantly different to the later timings. In addition to this, lodging at harvest was greater with earlier desiccation.

At Pine Ridge where the early desiccation treatment occurred at 25% grain moisture (much closer to the registered timing of <25% grain moisture), there was no significant effect of desiccation timing on grain yield or quality (Table 2).

Early desiccation did result in more soil water remaining after harvest at both sites (Table 3 and 4). The amount of residual water was greatest at the Wandobah site in the second desiccation timing with an additional 32 mm remaining, but this was accompanied by a 19% grain yield reduction.

At the Pine Ridge site, where there was no reduction in yield, earlier desiccation resulted in 20 mm of additional soil water. This amount declined as desiccation was delayed (Table 4).

At both sites the additional soil water was predominantly conserved in the sub soil (>60cm) indicating that the water was from reduced crop use rather than from rainfall received after desiccation. It should be remembered that an additional 20 mm of sub soil water is equivalent to 80 mm of extra rain during the fallow period and is most likely to be used by the next crop in the critical late season period during grain-fill.

Further trials are planned for the 2008 season with NSW DPI and NGA assessing sorghum desiccation timing and working on developing better indicators for growers and agronomists to use when picking the time to desiccate.

Further information:

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GRDC Project Code: NGA0002

'If soil carbon is included in emissions trading, how will it work?'

A GRDC workshop in Melbourne held earlier this year asked the question 'If soil carbon is included in emissions trading, how will it work?'

The workshop explored how emissions trading might work and considered issues such as: types of existing voluntary schemes; the capacity of cropping soils to sequester more carbon; measurement of soil carbon; which soil carbon fractions are most important and how to take advantage of all the benefits of soil carbon.

At present, under the Carbon Pollution Reduction Scheme (CPRS) Green Paper, agriculture will not in the short term have to formally account for carbon or greenhouse gas emissions. However, in the longer term (after 2015), it may have to. The industry has time to 'get this right'.

The workshop concluded that it is critical for the industry to be seen to be doing something to reduce greenhouse gas emissions. Supporting farmers wanting to be part of a voluntary (off-sets) scheme would be a good start. A voluntary scheme would not need to be as stringent as a regulated one for emissions trading, but could provide some clues on how a regulatory system might operate.

Some individuals may find commercial benefit in involvement now, and it could provide some product differentiation. Some market segments in developed countries (eg Europe) may increasingly want information of this nature.

Accounting for carbon as an industry could help in two ways.

Firstly, by enhancing environmental credentials. Voluntary accounting will help show that producers are aware and environmentally responsible in their food production.

Secondly, through improvement in system performance. Farming is the management of biological systems and cycles. There are soil health and production benefits to be had from higher soil organic carbon levels, as well as addressing climate change.

The workshop concluded that there is capacity for grain farmers to sequester more carbon. BUT

- The prospects are limited by rainfall (there is more scope in higher rainfall zones - above 500mm in temperate climates and above 700mm in subtropical zones),
- The prospects are better in degraded soils and gains taper away as 'healthier' levels are reached (ie, there could be perverse outcomes from carbon credits whereby 'poor' farmers benefit most),
- Gains in soil carbon can be lost (eg through erosion or cultivation),

- There can be net system 'losses' in terms of CO_2 equivalents, even though soil carbon is increasing (eg increased N_2O emission through the use of fertilisers or increased CH_4 emissions from increased livestock numbers), and
- There may be questions about what is 'additional' to expected standard practice.

Some of the ways that grain famers could sequester more carbon included increasing productivity, no-till / minimum till / stubble retention, precision agriculture, mixed farming systems, perennial (pasture) cropping systems, green manuring to increase biomass to soil, trees / agroforestry and waste management to name a few. Each option had their benefits and disadvantages and farmers should assess the cost / benefit ratio, looking at their whole system (not just soil and carbon) and include all consequences of change. In one quote from the workshop, carbon credits were described as "a bit like FlyBuys Points; a nice bonus but don't go shopping just to get them."

When considering carbon sequestration, the following points should be considered:

- Improved levels of soil organic carbon tend to be associated with production benefits and good farm management and soil organic carbon makes sense in its own right.
- If the goal of carbon sequestration is to combat the greenhouse effect, then a whole-system perspective is needed that includes consideration of N_2O (nitrous oxide) and CH_4 (methane) emissions.

Further information:

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The workshop summary and PowerPoint presentations are now available for downloading at: http://www.grdc.com.au/director/events/grdcpublications/soilcarbonworkshops

Updates now online

Previous editions of Grains Research Update newsletters for the Northern and Southern regions are now available online.

Further information:

http://www.grdc.com.au/director/events/researchupdates/updatenewsletters

Biosecurity online

Biosecurity threats from a number of exotic pests and pathogens are a constant threat to crop production and markets for Australian grain. Russian wheat aphid looms as a potentially devastating pest if it were to reach our shores alive, while new strains of rust diseases can easily hitch a ride on the clothing of people visiting crops in other countries.

GRDC has put together a web page providing a wide range of biosecurity information for grain growers and their advisers.

Information includes;

- Exotic Pest Fact Sheet
- Exotic pest identification through a pests and diseases image library
- Rust diseases of grain crops – what can Australian travellers do?
- AQIS website brochure 'What Can't I Take Into Australia'
- Department of Agriculture and Food WA website brochure 'Australian Grains Industry – Farm Biosecurity Plan

In addition, the site has links through to other organisations involved in biosecurity such as AUSBIOSEC, Biosecurity Australia and others.

Further information:

http://www.grdc.com.au/director/events/grdcpublications/biosecuritylinks

Diary Dates

February 2009	
10-11	**Wagga Wagga Grains Research Update** Contact: Jon Lamb, 08 8362 5417, jlcom@chariot.net.au
24-25	**Dubbo Grains Research Update** (RSL) Contact: (see # below)
24-26	**Pioneer Technology Show**, Wyreema Research Station, Wyreema Qld Contact: Craig Choice on 0418 717 448 or Craig.Choice@pioneer.com
26	**Gulargambone Grains Research Update** (Bowling Club) Contact: (see # below)
27	**Narrabri Grains Research Update** (RSL) Contact: (see # below)
March 2009	
3-4	**Goondiwindi Grains Research Update** (Community Centre) Contact: (see # below)
5	**Miles Grains Research Update** (Memorial Club) Contact: (see # below)

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