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New research on the impact and control of Rutherglen bug in sorghum

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SUMMARY

- RGB will reduce seed set in sorghum when present during flowering at densities in excess of 50 bugs per panicle (head). There is some compensation for this reduction in seed set.
- If RGB are present in sorghum through milky and soft-dough stages, they will feed directly on grain, impacting on seed size and quality. Feeding wounds will allow entry by bacteria and fungi, further discolouring and deteriorating the grain.
- From physiological maturity onwards, it is unlikely that RGB cause any impact on grain, but further research on this stage of infestation is ongoing.
- Alphacypermethrin and deltamethrin are the only effective options for controlling high densities of RGB in sorghum. Good coverage is critical to achieving good control.
- DPI&F is conducting research on control options, including biopesticides (fungal pathogens), that are effective against RGB without disrupting sorghum IPM.

Rutherglen bug (RGB) can infest sorghum crops in enormous numbers, and early 2007–08 sorghum crops have come under heavy attack. RGB have caused crop losses in Central Queensland, on the Darling Downs, and in northern NSW. Losses are the result of poor seed set, while RGB directly feeding on the seed results in pinched grain. There can also be grain discolouration by fungal and bacterial infection of damaged seed.

At this stage (late January) it looks as though the early crops have been most affected, with RGB not yet evident in later crops.

Adults RGB fly into crops, often prompted by storm activity transporting them

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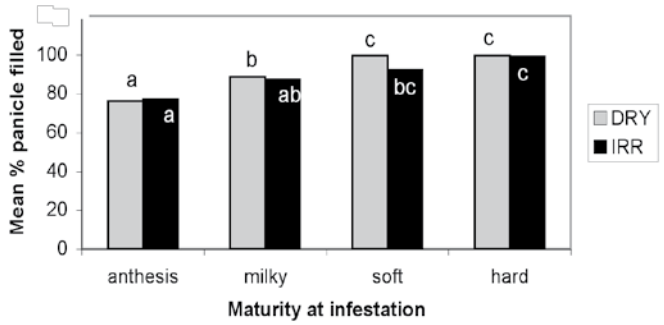
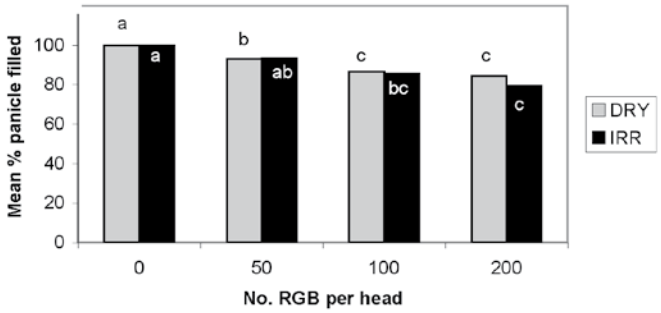
Maturing sorghum showing RGB feeding damage. Dark and shrivelled seed is caused by feeding. Infection by fungi and bacteria causes further deterioration of the seed.

FIGURE 1: Rutherglen bug will impact on seed set when the crop is exposed at anthesis (flowering)



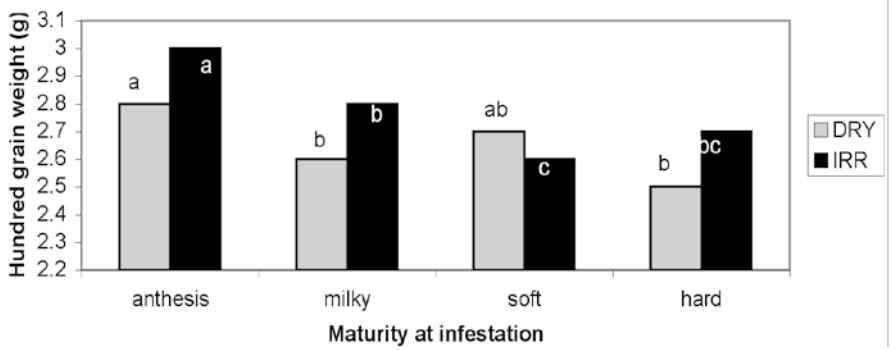
Means for each trial (dry/irrigated) are significantly different if they have the same letter (P=0.05).

FIGURE 2: Rutherglen bug cause a significant decrease in seed set at densities above 50–100 bugs per head



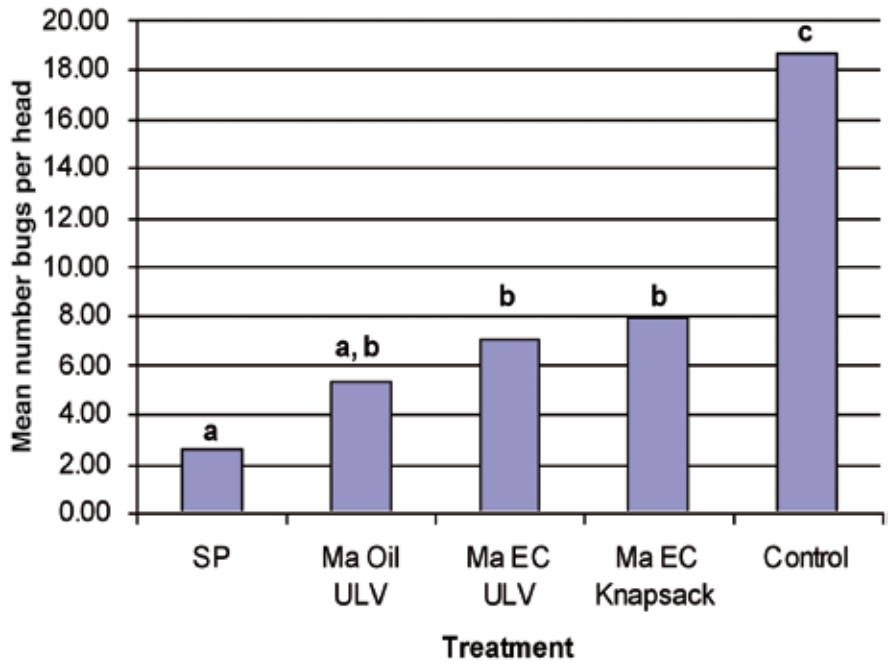
Means for each trial (dry/irrigated) are significantly different if they have the same letter (P=0.05).

FIGURE 3: The percentage of small seed produced is lower where panicles are exposed to bugs at earlier stages of maturity



Means for each trial (dry/irrigated) are significantly different if they have the same letter (P=0.05).

FIGURE 4: Control of RGB seven days after treatment with three formulations of *Metarhizium anisopilae*, and alphacypermethrin



◁i...NEW RGB RESEARCH

from some distance away. Local sources, for example weeds, can also be an attractant. Within a short time of arriving in a crop RGB start to lay eggs, and typically by the time the crop is filling and maturing, there are very large numbers of nymphs.

Infestations can be ongoing, so treatment of early infestations does not guarantee a RGB-free crop. In 2007–08 some fields were sprayed up to four times in an attempt to keep them RGB-free.

DPI&F has been conducting research on RGB in sorghum, as part of GRDC-funded projects, to determine an economic threshold, effective control options, and develop management strategies for this pest compatible with the established IPM programs for midge and Helicoverpa.

Moisture stress and RGB

In 2005–06 we conducted trials in an igloo so that we could control the amount of water the crop received. This approach was prompted by the feedback from agronomists who suggested that they thought they were seeing more pinched grain when RGB were present in moisture-stressed crops. Half the trial plots were fully irrigated, the other half received no further irrigation within two weeks of flowering.

The unirrigated treatment experienced considerable moisture stress through grain fill and maturity. Rutherglen bug were caged on heads at different stages of maturity (flowering, milky grain, soft grain and hard grain). Infestations were left on the heads for seven days and then removed.

At maturity, plants were harvested and seed set, seed size and yield measured. Grain quality (screenings) was assessed according to the sorghum receival standards.

Trial results

Exposure to RGB during anthesis (flowering) resulted in reduced seed set (Figure 1), indicating that RGB are feeding directly on the early-developing seed in the head and damaging it to the extent that it does not form and fill. Densities of 50–100 bugs per head for seven days were sufficient to reduce seed set by 15–20 per cent (Figure 2).

The percentage of screenings (seed less than two mm) increased when bugs were introduced later in head maturity (Figure 3). In other words, where the seed set was lowest, overall grain size was larger (lower proportion of screenings).

There is clearly some compensation within the panicles for the seed that has not set, and this phenomenon is well known in sorghum. For example, midge will reduce seed set in sorghum, but Bernie Franzmann (DPI&F) determined that the crop would compensate completely for up to 20 per cent reduction in seed set.

But compensation does complicate the relationship between crop loss and insect numbers, on which an economic threshold is based.

As a result, we have not, as yet, been able to determine an economic threshold for RGB, this research is ongoing.

RGB CONTROL OPTIONS

We have researched a range of unregistered products, attempting to find an option that causes minimal disruption to natural enemies which are important in the suppression of other sorghum pests such as Helicoverpa and aphids.

We have conducted a number of trials over two years which have included fipronil, indoxacarb, dimethoate (full and half rate +/– salt), alphacypermethrin and a range of formulations of a fungal pathogen (*Metarhizium anisopliae*).

Results of control trials

Alphacypermethrin is the only product we tested that reliably reduces high RGB numbers to an acceptable level. But commercial applications can have variable results, demonstrating how critical adequate water rates and good coverage are to satisfactory control. Currently a permit is being pursued for the use of alphacypermethrin and deltamethrin for RGB in sorghum.

These two products are suggested for RGB control because they do not have the beef export slaughter interval restrictions of some of the other synthetic pyrethroids.

Trial work with the fungal pathogen metarhizium, has shown some promise in early trials, with ULV being more effective than ECs in this early work (Figure 4). Research on the metarhizium is ongoing in the current season with the focus now on testing formulations.

A biopesticide is highly desirable, as it has little impact on natural enemies, and fits well into a sorghum pest management system that is currently based on the use of midge resistant varieties and NPV (nucleopolyhedrosis virus) for Helicoverpa.

RGB management – what we know

Sampling for RGB needs to start at anthesis, and can be done in conjunction with monitoring for Helicoverpa. Shake heads into a bucket and count the number of RGB adults and nymphs. The number of RGB can vary considerably between heads, so an average of 10 heads from across the field should be used as the basis for a decision.

The potential of RGB to prevent seed from setting means that it is important to control populations early if they exceed 50 per head.

Once the crop reaches physiological maturity (black layer) the grain has reached its maximum size and will lose moisture through to harvest. Whilst we are still doing trials to determine whether there is any impact of RGB on maturing grain, it seems unlikely that RGB feeding from this stage on will impact on yield. But large populations may warrant control close to harvest (at the time the crop is desiccated) to prevent contamination or clogging of machinery at harvest.

Thank you to growers and agronomists on the Darling Downs who helped with locating trial sites and accommodating trials on their farms. This work was funded by the GRDC.

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Comparison of panicles infested with different densities of Rutherglen bug at anthesis. Seed set declines as the density of bugs increases.