Technical Information

MIDGE – STILL A PROBLEM THAT REQUIRES CAREFUL MANAGEMENT

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Sorghum midge is still one of the most limiting factors in growing grain sorghum in Australia, and one that requires careful management. While the control of sorghum midge over recent years has been greatly boosted with the release of commercial resistant hybrids that have a midge tested rating, there is still some misunderstanding on how to manage this pest when growing midge resistant crops. While a midge resistant sorghum with a seven rating is seven (7) times more resistant than a susceptible (1 rated) hybrid, this doesn't mean that the rating can be used on its own to determine how many midge are needed per head before it is time to spray. The best way to obtain midge spray thresholds is to use the midge formulae that takes into account all of the following information:

(a) number of midge per metre of row (NM)
(b) midge rating of hybrid used of 1-7 (R)
(c) row width in cms (W)
(d) value of crop in $/tonne (V)
(e) cost of control in $/ha (COST)
(f) RESIDUAL LIFE OF CHEMICAL USED (RESIDUAL)

All this information is used in the below formula.

Spray if: $\frac{NM}{R}$ **is greater than** $\frac{COST \times W}{1.4 \times V \times RESIDUAL}$

The above formula determines whether the midge pressure is nigh enough to make it economical to spray. We know that one midge laying eggs will remove 1.4 grams of grain on a susceptible hybrid (rated 1). Growing hybrids with a rating of 7 will reduce this damage by a factor of seven, but in all cases a spray decision should be determined according to the cost of spraying, and the value of your crop. In many cases the value of crop you are saving is far less than the cost of spraying. The best way to monitor this pest is to assess midge numbers mid-morning at a number of locations throughout the crop from the date of first flower until the last plants have completed flowering. Most sprays such as synthetic pyrethroids have a 4 day residual effect. On the days after spraying new midge may move into a crop from elsewhere, even though effective chemical control has been applied. Such midge will lay only a few eggs before they die, and a new spray decision should be considered only after the residual effect of the chemical is gone. Using the midge formula is one tool of the management of midge in a sorghum crop. All growers need to consider a management plan in sorghum well before midge becomes a problem. The following practiced need to be considered before planting sorghum to avoid midge damage.

BEST MANAGEMENT PRACTICES TO AVOID MIDGE DAMAGE

- Plant early in the season.
- Plant highly resistant hybrids
- Plant crops that have uniform maturity, and provide adequate nutrition.
- Eradicate nearby Johnson grass and old sorghum plants.
- Avoid planting crops that flower in succession to tother nearby fields of sorghum.
- Determine economic insecticidal spray thresholds using the midge formula, performed separately on:
  - Individual fields taking into account different midge pressures across each field.
  - Individual hybrids that have different resistance ratings, and flowering patterns.

Planting early in the season with a highly resistant hybrid is one sure way to avoid midge damage. Other management practices such as producing a uniformly maturing crop will ensure that the flowering period of the whole field is reduced, effectively reducing the exposure time to midge. Continuous flowering for 2-3 weeks or more allows a new generation of midge to emerge and reinfect your crop. Nearby Johnson grass and earlier grain sorghum and forage sorghum crops that have flowered 2 or more weeks ago may produce large midge populations. It is these midge populations that have built up on successive flowering hosts that pose the greatest damage risk if left unchecked.

NEW MIDGE RESISTANCE RESEARCH

In 1996 a GRDC/DPI project at the Farming Systems Institute in Toowoomba was funded to investigate new sources of midge resistance in grain sorghum. This research has isolated a number of mechanisms of midge resistance not present in current Australian commercial hybrids. The primary midge resistance mechanism in Australian hybrids is termed ‘ovi positional antixenosis’.

In such hybrids midge females have difficulty laying, resulting in fewer eggs laid and lower levels of infestation. Screening of international breeding lines revealed a resistance mechanism in a number of lines which showed reduced midge damage even though initial egg lay was high. Such lines were found to contain ‘antibiosis’ type resistance. In ‘antibiotic’ lines midge damage was reduced by 30-60% due to midge larvae (grubs) dying off after eggs were laid. This ‘antibiotic’ material has been incorporated into DPI breeding lines, and a joint research effort between DPI and CSIRO is under way to look for molecular markers linked with this resistance. Isolating the position of these ‘antibiosis’ genes will greatly speed up selecting for ‘antibiosis’ in the plant breeding process.

The last two years of testing has confirmed the presence of another type of midge resistance, called ‘tolerance’. It is the first records of this resistance in the world. Little is known about this newly discovered mechanism of resistance except that in ‘tolerant’ lines, the seed has the potential to suffer only minor damage in the presence of midge larvae. In all cases to date, one midge larva that feeds on a filling sorghum grain will prevent the grain filling. In ‘tolerant’ lines, however, over 30% of infected seeds filled in the presence of midge larvae. It is still unclear why this occurs and more research aims to shed more light on this discovery. The future looks bright for midge resistance in grain sorghum