# The Sorghum Midge Tested Scheme

Sorghum midge (*Stenodiplosis sorghicola*) is a serious insect pest of grain sorghum in Australia. It can result not only in major damage, but also require several repeat insecticide applications during the season. Costs from residual losses and uncontrolled damage are estimated at being up to $10 million annually. Management of this pest is now centred on growing midge resistant hybrids.

***Image 1: Female midge laying into flowering sorghum floret***

Adult midge emerge in early spring and often spend several generations in Johnson grass (*Sorghum halepense*) before moving into sorghum crops. Females lay eggs into the flowering spikelets (Image 1). The larvae then hatch and feed on the developing grain, preventing normal seed development. The midge life cycle is between 2-4 weeks, so with optimal seasonal conditions, extremely high midge numbers can build-up over a growing season (particularly if the flowering period is extended by successive plantings). On a susceptible hybrid, offspring of each egg-laying adult can destroy up to 1.4g of grain. Large numbers can lead to devastating damage and in some cases, complete destruction of the crop.

To manage this problem, midge resistant hybrids were introduced over 30 years ago. In 1993, the (now) Queensland Department of Agriculture and Fisheries (DAF) in partnership with GRDC and the commercial sorghum breeding companies, developed a protocol for measuring the midge resistance (MR) levels in grain sorghum hybrids and assigning official MR ratings to all the commercially released lines. The rating number is a measure of: the amount of grain lost per visiting female midge per day. It ranges from 1 (nil resistance) through to 8+ ('practical field immunity' under most conditions and maximum commercially available resistance). In practical terms, this means that a 7 rated hybrid, when exposed to the same midge pressures as a 1 rated hybrid, will sustain 7 times less damage (Image 2).


***Image 2: Damage levels to different MR rated hybrids under equivalent midge pressures.***


***Image 3: An example of the official MR rating and logo***

The testing protocol, carried out by DAF, involves planting an annual trial in a semi-controlled environment (ideal for sorghum and midge) and subjecting the plants to high midge pressures. The resulting midge damage per head is then assessed for all entries. For evaluation purposes, the test (pre-commercial) hybrids are grown alongside standard/control lines of known MR ratings. After statistical analysis of the results, official MR ratings are then assigned for each hybrid. This testing regime provides a measure of confidence for growers by ensuring hybrids are independently assessed for relative midge resistance in a precise and consistent manner every time. Ratings and the accompanying logo (Image 3) are only issued to hybrids assessed by the scheme.

The commercial hybrid ratings are then made available by:

- Participating seed companies in packaging, advertising and marketing their sorghum hybrids.
- DAF and GRDC, on their respective websites.

Growers are able to use the MR rating as a guide to assist the selection of suitable hybrids at planting (Table 1) and as a tool for calculating threshold limits for crops, permitting more targeted insecticide applications. These threshold limits not only vary with resistance levels but take into account commodity prices and the cost of insecticides. They are also calculated using the factor of 1.4 gm of grain destroyed per one egg-laying adult. The following formula can be used to determine if midge pressures are high enough to make spraying economical:

**Spray if: M/R is greater than (C x W) / (V x RES x 1.4)**

| | |
|---|---|
| M (number of midge/metre of row) | R (Resistance rating of hybrid) |
| C (cost of control in $/ha) | W (row spacing/width (cm)) |
| V (value of crop in $/tonne) | RES (residual life of chemical used) |

Alternatively, The Beatsheet blog, a DAF run website about insect pest management issues relevant to Australia's northern grain region, has an online Economic Threshold Calculator to do this more easily. Follow this link http://thebeatsheet.com.au/economic-threshold-calculators/.

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***Table1: Current commercial hybrid ratings***

| Hybrid | MR Rating | Seed Company |
|---|---|---|
| HGS102 | 7 | Heritage Seeds |
| MR-Apollo | 7 | Pacific Seeds |
| Enforcer | 6 | NuSeed |
| HGS114 | 6 | Heritage Seeds |
| MR-Eclipse | 6 | Pacific Seeds |
| MR - Taurus | 6 | Pacific Seeds |
| 85G33 | 6 | Pioneer |
| MR-Bazley | 6 | Pacific Seeds |
| MR -Scorpio | 6 | Pacific Seeds |
| Dominator | 5 | NuSeed |
| Pacific MR43 | 5 | Pacific Seeds |
| 84G99 | 5 | Pioneer |
| 85G44 | 4 | Pioneer |
| Liberty White | 4 | NuSeed |
| MR-Buster | 4 | Pacific Seeds |
| 84G22 | 4 | Pioneer |
| Tiger | 3 | NuSeed |