BYGUM: Barnyard grass in cotton case study

GLYPHOSATE resistant awnless barnyard grass is now a common problem in Australian cotton farming systems. Growers and researchers have identified management tools and practices that can reduce the impact of this weed, but the economic fall-out has been more difficult to ascertain.

Dr David Thornby, former weeds researcher with the Queensland Department of Agriculture and Fisheries and now consulting researcher with Innokas, has developed a computer modelling program that allows growers and agronomists to test barnyard grass management scenarios and assess the economic impact prior to implementation, across a five-year rotation.

"The ecology and seed bank behaviour of awnless barnyard grass is quite well understood," he says. "Getting a handle on the economic value of different management strategies is a useful feature of the Barnyard Grass Understanding and Management [BYGUM] decision making tool. The analysis also shows the yield penalty incurred in each crop as a direct result of herbicide resistant barnyard grass incursions and the effect different management strategies would have on the weed seedbank."

The BYGUM program was adapted from the Australian Herbicide Resistance Initiative's Ryegrass Integrated Management [RIM] tool, which fulfils a similar purpose for assessing management scenarios for resistant annual ryegrass in southern cropping zones, but does not include parameters for cotton production or fallow management.

"We had 15 years' worth of weed ecology and seed bank research to draw on to adapt the RIM model to suit a barnyard grass in a sub-tropical environment growing both summer and winter crops," says David. "We also had large data sets for herbicide efficacy and the effect of other weed management practices on barnyard grass populations."

BYGUM provides growers with a robust means to evaluate five-year rotations including testing the economic value of fallows and fallow weed management, winter and summer crop sequences, cover crops, tillage, harvest weed seed control, different herbicide options and more.

David Thornby.

The computer program has a simple step-through wizard design for users to:

- Define the basics (prices, costs, herbicide options, base yields);
- Build a rotation (five years) and specify weed controls; and,
- Check the results and compare with other scenarios.

When using BYGUM to assess a current or proposed strategy, users can enter parameters about the size of the seed bank and the cost, type and efficacy level of herbicides. They can easily test what will happen if the chosen herbicide doesn't work or show the effect of using a different herbicide or another weed management tool.

"The cost of managing resistant barnyard grass can be assessed across different strategies and under different seasonal conditions," he says. "The user can define many different parameters or use the default settings, including commodity prices and yields."

The non-herbicide management tools included in the model are harvest weed seed management (for the grain phase of the system), cover crops and tillage. David says brown manuring millet and leaving it standing for improved moisture conservation is an effective tool that growers could investigate. He says tillage operations used in cotton systems for the purposes of pupae busting and bed formation generally have little effect on barnyard grass populations or the seedbank.

"Tillage that is timed to control barnyard grass soon after emergence can be very effective," he says. "A portion of the seed that is present in the soil however will remain viable for 12–18 months if buried to a depth of 10 cm and seed can germinate from a depth of 5 cm given the right conditions."

Over winter, there is significant mortality of seed in the seed bank, which means tillage following early germinations in spring can really drive down the seed bank as the majority of the seed present has germinated and very few viable seeds are buried. In most years it is safe to assume that five barnyard grass cohorts will germinate between September and March, largely in response to rainfall and temperature conditions.

"In-crop, barnyard grass plants that germinate in the first cohort will have the greatest opportunity to establish using abundant moisture and nutrient resources and produce large quantities of seed before the crop is able to compete," he says. "Later cohorts tend to be shaded out by the crop and produce far less seed."

Although BYGUM has been developed specifically for analysing control options for BYG in cotton it can also be used for other summer crops, particularly sorghum, and for summer fallows. David says it also has application for other summer grasses, such as feathertop Rhodes grass, but suggests that users carefully check the herbicide efficacy parameters. It is also not recommended for use on other grasses in Central Queensland farming systems.

BYGUM has been developed with the financial and intellectual support of CRDC, UWA, GRDC, QAAFI, DAF and UQ. It has been tested by leading cotton growers and agronomists.

Try BYGUM for yourself: http://www.cottoninfo.com.au/barnyard-grass-understanding-and-management-bygum

For more information about managing glyphosate resistance in barnyard grass, visit the Weedsmart website: www.weedsmart.org.au