

### Glyphosate resistance in barnyard grass

Northern NSW is the home of the world's first suspected case of glyphosate resistance in barnyard grass. Seeds from suspicious plants taken from a dryland cropping property near the Lower Namoi were sent to Dr Peter Boutsalis of Plant Science Consulting and the University of Adelaide and have tested positive. Further testing is now required to validate the initial diagnosis.

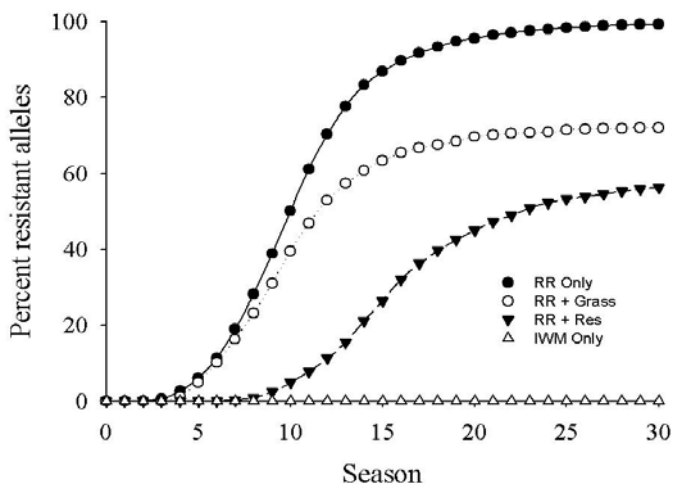
NSW DPI technical specialist for weeds, Andrew Storrie, said "The plants were found in a paddock with a long history of winter cropping. The summer fallow weed control relied solely on glyphosate, with 15 to 20 applications over a five year period. A study of the paddock history and the current situation with the surviving barnyard grass plants strongly support Dr Boutsalis' test results. The situation also suggests that glyphosate resistant barnyard grass will be present on other farms. Therefore, farmers in the northern cropping zone must now check for barnyard grass plants that have survived one or more applications of glyphosate, and contact the NSW DPI about collecting seed for resistance testing where survivors occur."

Early warning should help farmers to start managing the extent of the resistance problem now. Particularly when heavy infestations of barnyard grass are being targeted this summer, control strategies should aim to prevent all plants from setting seed, even if this requires two control tactics to be used on each flush of weeds.

#### Likelihood of resistance in cotton

Barnyard grass was one of the focus weeds in Monsanto, Weed CRC and Cotton CRC sponsored PhD which modelled the potential for glyphosate resistance to develop in cotton farming systems with various approaches to weed management. In a cotton farming system where there was total reliance on Roundup Ready® technology for weed control, the model predicted the evolution of glyphosate resistance within 5 years leading to control failures occurring within 12-17 years. The model outputs are shown in the graph below.

Modelled rate of glyphosate resistance development in barnyard grass populations in cotton systems with various approaches to weed management. Source; Jeff Werth 2006.



While the case of resistance currently being investigated is in a winter cropping system, resistance is an equally real threat to Roundup Ready® cotton systems where reliance on glyphosate creates a virtual summer fallow from a weed management perspective. When a fully integrated approach to weed management was used, resistance did not begin to develop over the 30 year period of the simulation. One of the key reasons for the success of an IWM approach is the prevention of seed set at all stages.

#### Barnyard grass facts

When barnyard grass germinates with a cotton crop at a density of only 1 plant/m, each of those plants can produce 24,000 seeds. Delaying germination by six weeks allows crop competition to reduce seed production to less than 6,500 seeds/plant. One season of poor control can set paddocks up for many years of high weed numbers and difficult control – *it is critical to stop seed set.*

Barnyard grass has a long lived seed bank, particularly when buried by cultivation. At 80mm below the soil surface full seed viability is maintained for 3 years before declining over the next 10 years. On the soil surface seed will exhibit a strong dormancy, meaning most will not germinate until the following season. Viability then declines more rapidly than if buried.

Optimum conditions for germination are moist soil and soil temperatures in the range of 32-37°C – part of the reason we see barnyard grass emerge from late spring right through summer and into autumn anytime there is rainfall or irrigation.

Barnyard grass is a self pollinating species. This is a double-edged sword when it comes to resistance development. On one hand, keeping numbers low reduces the chance of a resistant individual being among the population, but on the other hand, when a resistant individual occurs, all its progeny will carry the trait.

There is already resistance to herbicide mode-of-action groups A, B and C overseas, and one population in northern NSW is resistant to atrazine - group C.

The GRDC-funded project 'Risk assessment and preventative strategies for herbicide resistance in the northern grains region' recently reported that barnyard grass was one of the four weeds at most risk of developing resistance in this region. The others were liverseed grass, wild oats and sow thistle.

#### Further information

In the current dry conditions, plant stress can be confused with resistance. For more information about monitoring and sampling for resistance testing, contact Andrew Storrie or Tony Cook at NSW DPI in Tamworth – 6763 1100. Or to discuss management options for barnyard grass in cotton systems, contact Graham Charles at the ACRI – 6799 1524.