

## Get obsessed with having a really low seed bank!

MIKE ROBERTS

**Herbicides are no longer the answer to every weed control problem, says Peter Newman, Communications Leader with the Australian Herbicide Resistance Initiative.**

“It’s not about having a low seed bank. It’s about getting obsessed with having a REALLY low seed bank, as close to zero as you can get!”

This is the key weed control message and the only way forward as the era of plentiful, effective herbicides draws to a close, according to Peter Newman, Communications Leader with the Australian Herbicide Resistance Initiative (AHRI).

Fewer weeds mean more profitable crops, he told growers at the SANTFA conference, but it’s not just about that; it’s about farmers being able to call the shots rather than the weeds dictating the play.

“Farmers need to be able to select the best, most profitable rotation, determine the best sowing time and plant that crop. Once we decide what to grow, let’s throw enough weed management at it to make it work. To do this we need a low enough weed seed bank to make those weed management strategies effective.”

Peter referred to Charles Darwin’s message that evolution happens as a result of a combination of population size and genetic diversity.

“Ryegrass is the world champion of resistance evolution because it is so genetically diverse. We can’t do anything about its genetic diversity but we can reduce it to a small enough population to slow the evolution of resistance.”

Figure 1 represents what has happened on many Australian farms, from The Good

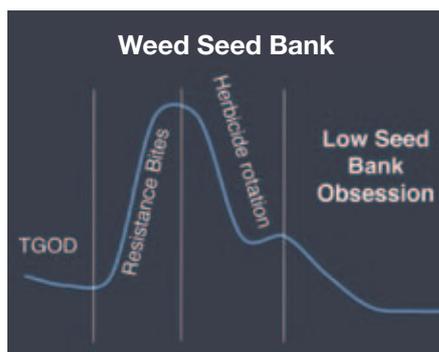


FIGURE 1



PETER NEWMAN AND GRDC'S RICHARD KONZAG AT THE SANTFA CONFERENCE.

Old Days (TGOD) when herbicides used to work, through resistance biting and the seed bank blowing out. This prompted farmers to begin rotating herbicides, which is effective but never runs the seed bank down as low as it used to be, he said. The reason for this is not resistance, but the fact they are forced to rotate to pre-emergent chemicals that may only be 70-90% effective, which is not as good as Hoegrass was when it was working.

He is confident growers who develop a 'low seed bank obsession' and use non-herbicide weed control methods can get weed numbers down to levels like those in the far right section of the graph.

### Metabolic resistance

The need to use non-chemical controls is reinforced by the work of AHRI researcher Roberto Busi, who studies the evolution of herbicide resistance and had created Sakura resistance in ryegrass the laboratory before the product was released for commercial use in Australia. The Sakura-resistant ryegrass was also resistant to Boxer Gold and Avadex, despite never having been exposed to either of those herbicides.

Metabolic resistance was the likely culprit here, Peter said. Herbicides are generally designed to attack a particular target site in the plant but there are enzymes that can destroy a herbicide by metabolising it before it reaches the target site in the plant. When this occurs, it is referred to as metabolic resistance. In this instance it is highly likely that herbicides used in the 1980s pre-conditioned the ryegrass population used in the AHRI trial for resistance to Sakura some 30 years later.

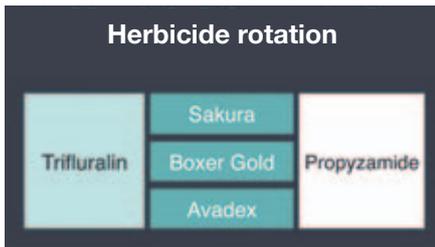
There is concern that this mechanism may pose a threat to future herbicides.

“We are only just starting to understand that some herbicides can be metabolised and others cannot,” Peter said.

“Target site resistance has been very well researched because it is easy to study compared to metabolic resistance. So far, there is little or no metabolic resistance to glyphosate, clethodim, atrazine, trifluralin or propyzamide. By comparison, Fop, SU and Imi herbicides are easily metabolised.”

### Harvest weed seed control

Peter believes it is imperative for growers to incorporate effective non-herbicide



ROTATE BETWEEN THE BIG BOXES. IT'S NOT A GOOD IDEA TO ROTATE FROM SAKURA TO BOXER GOLD TO AVADEX.

tools into their cropping systems, with harvest weed seed control (HWSC) the first option to consider.

AHRI's Michael Walsh has found that wild radish is usually carrying 100% of its seeds at the beginning of harvest and brome grass is still hanging onto around 80% at the same time (Figure 2). That means harvest provides a good opportunity to catch these seeds and deal with them before they drop onto the soil, eliminating the need for them to be dealt with in the following crop.

Taking 60-70% of the weed seeds in a paddock out at harvest can dramatically reduce the seed bank but many farmers don't use harvest weed seed control because it seems like a lot of effort, so when they harvest they spread the weed seeds present out for next year, Peter said.

**It's about farmers being able to call the shots rather than the weeds dictating the play.**

While working for the WA Department of Agriculture and Food, Peter along with Michael Walsh, set up a project looking at the ryegrass burden in 30 focus paddocks nominated by farmers. Each farmer nominated what they considered to be a dirty ryegrass paddock and counts were done every August between 2001 and 2013.

One group of farmers practiced HWSC, usually narrow windrow burning every second year plus crop topping and crop/herbicide rotation. The other group was more herbicide focused and used windrow-burning maybe once in 10 years. The group who relied mainly on chemical control reduced weed numbers to about 10 plants/m<sup>2</sup> but could not get any lower because trifluralin, their

standard herbicide, did not give 100% control. Those who practiced HWSC every second year reduced their weed numbers to near zero (Figure 3).

There are many options for harvest weed seed control.

### Narrow windrow burning

Narrow windrow burning is a widely-adopted, entry-level weed seed control technique used by 80% of growers in the northern WA cropping region, Peter said. He expects it to be used by many upper Eyre Peninsula growers in 2015 and in parts of NSW for the first time next season.

"There's no doubt windrow burning can be difficult to get right and it sends half our residue up in smoke, which is not ideal. Farmers who do it love it for how it works on their weed control but soon start looking for something better."

### Chaff carts

The original chaff carts were effective in removing weed seeds from the paddock but the dumps of chaff were often difficult to burn in a reasonable period of time, which created a host of problems. New carts with conveyor belts that carry straw as well as chaff and seed produce

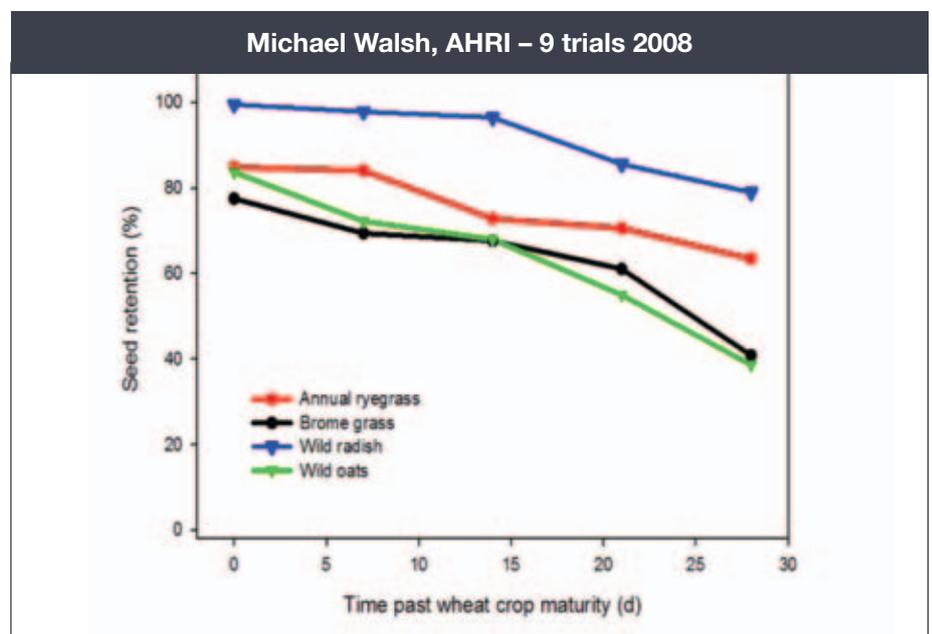


FIGURE 2

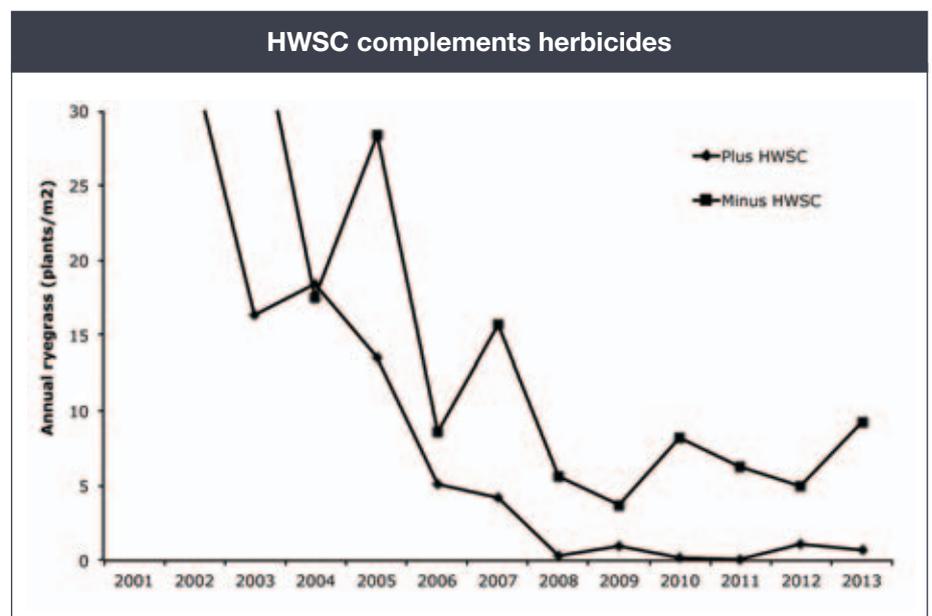


FIGURE 3

dumps that burn out in six hours because they are more open. Peter says hundreds of farmers are converting to carts fed by conveyer belts. "They are a brilliant tool that works financially in every rainfall zone across the country."

Chaff carts and sheep are a good combination because the chaff and the seed it contains can be good feed for the stock, eliminating or reducing the need to burn chaff. Most ryegrass seed eaten by sheep is destroyed but 3-6% remains viable. Cattle are less effective seed destroyers, with 15-20% of the seed consumed remaining viable.

## Tramlines

Growers in WA have been putting chaff on permanent tramlines for eight or nine years and are finding that weeds don't really like growing in a pile of chaff, Peter said. He has no hard data on this method at this stage but it seems that placing chaff from the header onto 'tramlines' in controlled traffic systems is a cheap, easy method of harvest-time weed seed management that involves no burning and no extra jobs after harvest.

## Seed destructor

The seed destructor is the brainchild of

Ray Harrington, who began its development some 19 years ago. It mechanically destroys weed seeds before spreading the residue back onto the paddock.

A trailed version of the destructor is being manufactured and work is underway to develop a harvester with an integrated seed destruction mechanism.

## Chaff lining

The concept of chaff lining was developed by Esperance grain grower Mick Fels. It is a simple, low-cost option for growers using discs. It involves placing a narrow windrow of chaff and weed seeds on the same line each year, then sowing through it with a disc seeder.

Mick didn't want to put weed seeds on his wheel tracks because he thought driving over them would encourage them to grow. Instead he decided to drop the chaff in a row off the wheel tracks on the basis that he'd rather have all the weeds in one place competing with each other, although he has found that few weeds grow in the chaff.

If he has a 'bad strip' in which a lot of weeds do germinate, he puts a canola windrow over it and burns it to destroy the weed seeds.

## Direct baling

Growers who have a good market for baled straw nearby might be able to turn their weed seeds into profit by baling the straw as it comes out the back of the header, Peter said. This removes nutrients from the paddock, but if the market for the bales is profitable enough the nutrients can be replaced as fertiliser and you can still make a profit while reducing the weed burden.

## Crop competition

Encouraging crop competition can complement harvest weed seed control.

Increasing seeding rate decreases weed seed set but often doesn't increase yield, which means extra cost for no extra yield but better weed control.

Changing row spacing can also impact weed populations.

Researcher Glen Riethmuller, in a long-term trial in Merriken, WA, in which he used the same row spacings in the same plots for 27 years, found that ryegrass seed set decreases with row spacing (Figure 4).

Other trials have shown there is higher weed pressure with a low seeding rate and



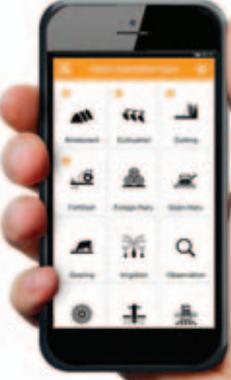
FIGURE 4



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wider row spacing than with higher seeding rates and closer rows, and that cereal yields increase by an average of 1% for every 25mm reduction in row spacing.

Peter says all this points to 'more crop, less weed and win/win'.

Growers often point to problems such as difficulties getting through stubble and higher machinery costs with narrow rows, but it can be done, Peter said.

One Geraldton grower is using 175mm row spacing in his continuous cropping, stubble retention system and using a chaff cart to capture weed seeds at harvest. "It's important for him that the crop be closely spaced so the weeds have to grow up to get light, making it easier to capture the seeds and get them in the cart at harvest."

### Crop orientation

WA Department of Agriculture and Food researcher Catherine Borger has shown that east-west sowing can halve weed seed set.

**Ryegrass is the world champion of resistance evolution because it is so genetically diverse.**

With east-west rows the crop shades the inter-row space. With north-south sowing, sunlight can reach the soil between the rows, encouraging weed growth.

Achieving an east-west alignment is not always possible, Peter said, but where it is it is worth trying, particularly for low-rainfall growers looking for low-cost options.

### Basics

These concepts need to be applied in the context of good agronomics.

"Don't neglect the basics. Healthy soils enable crops to better compete with weeds. So, for example, lime a soil that needs it.

"When you do have to spray weeds make sure you get them at the correct growth stage, use the correct rate and spray in the best conditions."

While there are multiple options and much to think about, he said, a grower who gets obsessed with having a really low weed seed bank will be looking at more profitable rotations and crops. And to do that he will need to use non-herbicide weed control methods.

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