Harvest weed seed control

Michael Walsh
Australian Herbicide Resistance Initiative
University of Western Australia
www.ahri.uwa.edu.au
Multiple resistance in annual ryegrass populations

98% of pop’s resistant

10 million hectares

Owen et al. 2014
Harvest weed seed control

Developed in response to herbicide resistance

Because of potential to target weed seeds
### Target seed production at harvest

<table>
<thead>
<tr>
<th>Weed species</th>
<th>Retained seed* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lolium rigidum</em></td>
<td>88</td>
</tr>
<tr>
<td><em>Raphanus raphanistrum</em></td>
<td>99</td>
</tr>
<tr>
<td><em>Bromus spp.</em></td>
<td>73</td>
</tr>
<tr>
<td><em>Avena spp.</em></td>
<td>85</td>
</tr>
</tbody>
</table>

* Seed above harvester cutting height (15cm)
Weed seed retention during wheat crop harvest

Time post wheat crop maturity (d)

Seed retention (%)

Lolium rigidum
Bromus spp.
Raphanus raphanistrum
Avena spp.
Weed seed in chaff fraction

Rewarding the Survivors!!
Up to 85% of annual ryegrass and wild radish seed removed

Chaff carts

Grazing  Lot feeding  Autumn burning
Glenvar Bale Direct System

Financial opportunity
Market dependent
Nutrient removal
Weed seed removal (95% annual ryegrass)
Narrow Windrow Burning

Establish windrows at harvest

Burn residues in autumn

Chute fitted to harvester  Concentrate residues at harvest  Burn windrows in autumn
Narrow Windrow Burning

99% control of annual rye grass and wild radish
Chaff processing
Cagemill results

>90% kill of annual ryegrass seed

No effect of chaff type
Harrington seed destructor
# Harrington seed destructor

![Photo](image_url)

<table>
<thead>
<tr>
<th></th>
<th>Annual ryegrass</th>
<th>Wild radish</th>
<th>Wild oats</th>
<th>Brome grass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed destroyed in chaff (%)</td>
<td>95</td>
<td>92</td>
<td>99</td>
<td>98</td>
</tr>
</tbody>
</table>
Harrington seed destructor

Highly effective chaff processing system
No need for post-harvest operations
Retention of all harvest residues
Prototype Integrated Mill
Comparison of HWSC systems

Narrow Windrow Burning, Chaff Carts and HSD
Replicated treatments at 25 sites
# Lolium emergence in autumn

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Reduction in <em>Lolium</em> emergence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSD</td>
<td>57</td>
</tr>
<tr>
<td>Chaff cart</td>
<td>56</td>
</tr>
<tr>
<td>Narrow windrow burn</td>
<td>57</td>
</tr>
<tr>
<td>LSD (P=0.05)</td>
<td>9</td>
</tr>
</tbody>
</table>
Long term effects of HWSC

Annual ryegrass (plants/m²)

- Plus HWSC
- Minus HWSC

Walsh et al. Weed Tech. 2013
Walsh et al 2013
HWSC complements herbicides

Focus paddocks - surviving ryegrass in spring
Plus HWSC - 12 growers using HWSC in 38% of crops
Minus HWSC - 13 growers using HWSC in only 11% of crops

- Annual ryegrass plants/m²
- Year

Graph showing the decline in annual ryegrass plants/m² from 2001 to 2014, comparing treatments with and without HWSC.
Low weed densities are insurance against resistance evolution
New Model HSD
Commerciaally available options for targeting weed seed bearing chaff fraction

Chaff cart  Bale Direct  Narrow windrow burning

Harrington Seed Destructor
HWSC 2015

October – November 2015

Compare Integrated mill, chaff cart, narrow windrow burning, chaff tramlining

Targeting wild oats, annual ryegrass, brassica spp. fleabane

Central Queensland, Eastern Downs, Western Downs and northern NSW

We need 12 sites in wheat crops
#50 Keith Richards, not Jimi Hendrix

The old rock star adage is ‘live hard, die young’. Keith Richards, on the other hand, has somehow managed to buck the trend and ‘live hard, (and will) die old’. How Keith has lived so long will go down as one of the world’s great unsolved mysteries.

Many herbicides are ‘living hard, dying young’.

We need to work out how to get herbicides to ‘live hard, die old’.
Thank you