Are pre-emergent herbicides the solution to manage resistance in Australia?

Roberto Busi
roberto.busi@uwa.edu.au
Crop loss due to pests

Loss in major crops (%)

Potential loss
Actual loss

Ref: Oerke 2006
Ryegrass agro-ecology – key points

- Cross-pollinated, genetically diverse weed
- Competitive and prolific weed (30,000 seeds/pl), large field populations.
- 70-80% emergence at season break
- High-level control required (aim < 5 pl/m²)
- Herbicide overreliance
- **Rapid evolution of herbicide resistance**
No new herbicide modes of action

Ref: SO Duke 2012
WA resistance survey - ryegrass

Resistant seed samples (%)

Year

1998
2003
2010

Diclofop
Clethodim
Trifluralin
Glyphosate

Greater use of pre-em herbicides in response to resistance

Ref: P Newman 2013
Pre-emergence herbicides for ryegrass control

- Dimethenamid-P (K)
- S-Metolachlor (K)
- Propyzamide (D)
- Prosulfocarb (J+K)
- Pyroxasulfone (K)
- Triallate (J)
- Trifluralin (D)
- Flufenacet (K)*
- Metazachlor (K)*
Pyroxasulfone low dose selection

Ref: Busi et al 2012
Rye grass resistant to pyroxasulfone

Parent 1st 2nd 3rd

Trifluralin resistant
Cross-resistance to prosulfocarb

Selection with pyroxasulfone
F₁ plants controlled by prosulfocarb and propyzamide

Rotate at full dose to delay resistance.
Extension message for agronomists

Rotate BETWEEN the boxes

Rotation WITHIN the boxes

Trifluralin

Pyroxasulfone
Prosulfocarb
Triallate

Propyzamide

What about mixtures?
Preliminary modeling on resistance

1 = Trifluralin; 2 = Boxer G; 3 = Sakura; 4 = Propyzamide

Ref: Busi, Renton and Powles, unpublished
Pre-em herbicides are under pressure and their exclusive use may not/won’t be sustainable (cross-resistance).

Cultural practices and/or mechanical weed control, despite their lower efficacy, must complement herbicides.

Rotation at full dose and herbicide mixtures are effective options (more work needed).

Research should support farmers’ choice for weed control on farm and boost their confidence in adopting IWM.