



Powles Plain English

Making crops and weeds research interesting, understandable, and accessible to all.

Colleagues,

For your information please find attached an AHRI publication in Weed Research (2012) by Busi et al entitled “Understanding the potential for resistance evolution to the new herbicide pyroxasulfone: field selection at high doses versus recurrent selection at low doses”.

We are very proud of this research because it is the first time that a new herbicide has been evaluated for resistance evolution potential BEFORE the herbicide is commercialised. Pyroxasulfone has in 2012 been registered in Australia for use in cereals and is registered or very close to registration in Canada and the USA. In earlier AHRI research Walsh et al (2011) showed that pyroxasulfone is effective on the major grass weed *Lolium rigidum* (attached paper).

Firstly, in this research we examined in *Lolium rigidum* for possible major genes that could endow pyroxasulfone resistance. This was done by screening 100 million herbicide susceptible *Lolium rigidum* plants at high pyroxasulfone dose. We did NOT find a resistant individual. Of course this does not prove that there are no major resistance genes but does provide an indication that any such resistance genes are likely to be rare.

Secondly, we subjected a very small population of herbicide susceptible *Lolium rigidum* and a very small population of multiple herbicide resistant *Lolium rigidum* (initially pyroxasulfone susceptible) over three consecutive generations at low (sub-lethal) rates of pyroxasulfone. In the multiple resistant population we rapidly selected for pyroxasulfone resistance! It is likely but remains to be established that we have selected for metabolism genes present in multiple herbicide resistant *Lolium*. This study adds to the several studies that we have published in AHRI showing the adverse effects of low herbicide dose in enabling metabolism based resistance evolution, in genetically diverse cross-pollinated *Lolium*. Herbicides should always be used at doses that cause very high mortality!

Thus, for the first time with a new herbicide, information regarding the potential for resistance evolution is available prior to herbicide commercialisation. For pyroxasulfone, we have the evidence that effective stewardship programmes should be developed to ensure and encourage that pyroxasulfone be used at the full label rate to minimise the possibility of rapid low-dose induced resistance evolution. This message is being conveyed in the marketing of pyroxasulfone (Sakura) in Australia and we hope this will occur wherever pyroxasulfone is registered.

Thank you,

Stephen Powles, FAA, FTSE
Winthrop Professor,
Director, Australian Herbicide Resistance Initiative
T: 08 6488 7833, E: stephen.powles@uwa.edu.au
(M086) The University of Western Australia