Identification of field resistance to HPPD-inhibiting herbicides in wild radish

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Summary Reliance on 4-hydroxyphenylpyruvate dioxygenase (HPPD)-inhibiting herbicides for the control of multiple-resistant wild radish (*Raphanus raphanistrum*) populations has been common practice for the last decade in Australian wheat crops. Such an overreliance on HPPD herbicides has increased the risk for resistance evolution and resulted in reduced weed control in wild radish-infested crops. RESULTS Two wild radish populations (86-2020 and 91-2020) identified as putative resistant in an initial large-scale screening were characterized and confirmed to be 5- to 8-fold (comparison of LD50 values) resistant to the HPPD inhibitor pyrasulfotole, when plants were treated at the four-leaf stage, than the susceptible control population. Consistently, the two pyrasulfotole-resistant populations exhibited up to 4-fold resistance to the pre-formulated synergistic herbicide mixture pyrasulfutole + bromoxynil and up to 9- and 11-fold cross-resistance to mesotrione and topramezone, respectively. Results were confirmed by a small-plot trial conducted in the original field suspected of resistance where the mixtures pyrasulfotole + bromoxynil or topramezone + bromoxynil applied post-emergence delivered a significantly lower control of wild radish (79-87%) than mesotrione pre-emergence (>99%).
Conclusion
The first case of field resistance to HPPD herbicides in wild radish urges a turn in weed control practices. The mitigation of herbicide resistance in continuous no-till cropping requires constant optimization of the herbicide technology via the alternation and mixtures of multiple (old and novel) modes of action, use of pre-emergence herbicides and delivery to most sensitive plant stages. This must be integrated by proactive adoption of non-chemical weed control options, weed seed destruction and crop rotation.

Keywords Herbicide resistance