Resistance management strategies need diversity

By Steven Chang and Wesley Mair

The importance of diversity in pest management strategies emerged as a key theme at the second annual national pesticide resistance workshop held in Western Australia.

All of the major herbicide, fungicide, insecticide and pesticide resistance issues facing Australia were discussed at the GRDC-sponsored workshop with a view to looking at ways that broader resistance research might contribute to improved integrated pest management strategies.

The workshop identified potential for greater research collaboration, particularly with regards to more effective grower communication and the role of pesticide dose rates in developing resistance.

Presentations from the Australian Herbicide Resistance Initiative at the University of Western Australia outlined how low dose rates may accelerate herbicide resistance in annual ryegrass (Lolium rigidium) and wild radish (Raphanus raphanistrum). In wild radish, an integrated strategy of harvest weed seed control combined with herbicide use was now required for effective weed control and herbicide resistance management.

Discussing resistance in North America, Dr Terry Wright of Dow AgroSciences said over-reliance on glyphosate herbicides in the Roundup Ready® system had shifted weed populations significantly towards glyphosate resistance.

The new Dow AgroSciences Enlist system had introduced tolerance traits to the herbicide 2,4-D into maize, soybeans and cotton, allowing growers to use this herbicide to complement glyphosate and glufosinate. Diversified weed management using multiple modes of action had become crucial and could help prolong the effective lifespan of each herbicide, Dr Wright said.

Madeline Tucker, from the Australian Centre for Necrotrophic Fungal Pathogens (ACNFP) at Curtin University, said the resistance of powdery mildew (Blumeria graminis f.sp. hordei) to triazole fungicides in WA represented a ‘cliff edge’ for growers, in combination with the continued use of sensitive and highly sensitive barley varieties.

She said that effective control of barley powdery mildew would require the registration of fungicides with additional modes of action, such as the succinate dehydrogenase inhibitors, and the adoption of resistant barley varieties.

UK researcher Dr Frank van den Bosch of Rothamsted Research reported that modelling of the evolution of fungicide resistance showed that both increasing fungicide dose rates and increasing the number of applications could increase the development of resistance. However, he said that using mixtures and different modes of action decreased selection for resistance.

Dr Paul Umina and Professor Ary Hoffmann, from the cesar research group and the University of Melbourne, reported on efforts to develop models to help predict the likelihood of insecticide resistance evolving in invertebrate pest species. Early results from the modelling have identified Bryobia mites, cowpea aphids and cabbage white butterflies as being at high risk of developing insecticide resistance (Table 1).

Madeline Tucker: Effective control of barley powdery mildew would require the registration of fungicides with additional modes of action, such as the succinate dehydrogenase inhibitors, and the adoption of resistant barley varieties.

GRDC Research Codes
UWAO0146. GRS10035
At high risk for developing Meeicicle resisting...t of insecticide resistance of key pest species

<table>
<thead>
<tr>
<th>Pest Species</th>
<th>Status of resistance</th>
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<tbody>
<tr>
<td>Redlegged earth mite (Halotydeus destructor)</td>
<td>Widespread high resistance to synthetic pyrethroid insecticides such as bifenthrin and alpha-cypermethrin in Western Australia</td>
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<tr>
<td>Green peach aphid (Myzus persicae)</td>
<td>Widespread resistance to synthetic pyrethroids in Western Australia. Resistance to organophosphate and carbamate insecticides common across Australia</td>
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<tr>
<td>Bryobia mite, cowpea aphid and cabbage white butterfly</td>
<td>At high risk for developing insecticide resistance</td>
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SOURCE: CESAR, UNIVERSITY OF MELBOURNE