

Coordinated resistance monitoring

Improved integration of resistance monitoring will help the grains industry react quickly to new resistances **By Pat Collins**

THE RELIANCE OF the grains industry on phosphine and a limited range of grain protectants to maintain freedom from insect infestation is unlikely to change in the foreseeable future because of the high cost of alternatives. However, experience has shown that the efficacy of these materials can be seriously jeopardised by the development of resistance in target pests.

To assist in the management of this threat, the grains industry needs information on the distribution, frequency and strength of resistance. A nationally coordinated resistance monitoring program has been developed through the CRC for National Plant Biosecurity (CRCNPB) – an initiative supported by the GRDC – to provide this assistance. The program will provide industry with: an early warning of the emergence of new resistances; information on spread of known resistance; assessment of the likely impact on industry of new resistance developments; and diagnosis of control failures.

The project combines the expertise of scientists from each of the three major regions: Dr Manoj Nayak from the Queensland Department of Primary Industries and Fisheries (QDPI&F) (Northern), Dr Joanne Holloway from the NSW Department of Primary Industries (DPI) (Southern) and Rob Emery from the Department of Agriculture and Food, Western Australia (DAFWA) (Western).

Project staff collect insect pest samples from farms, grain merchants and central storages across all grain-production regions of Australia. The insects are then subjected to a battery of tests in the laboratory to determine their resistance status. In 2007-08 a total of

2980 insect strains were collected from across Australia.

Although the overall frequency of weak resistance to phosphine remains high in lesser grain borers, rust-red flour beetles and rice weevils, the detection of strong resistance in several populations of flat grain beetles in eastern Australia signals the emergence of a very serious resistance issue. The level of this resistance is the highest ever detected in Australia, surpassing levels previously detected in the lesser grain borer and psocids. The CRCNPB is now undertaking a project to develop fumigation protocols that will effectively contain and eradicate these strongly phosphine-resistant pests.

In eastern Australia resistance to S-methoprene in lesser grain borers is common, but the lack of resistance to S-methoprene in the saw-toothed grain beetle populations is good news. Fenitrothion remains effective against rice weevil and rust-red flour beetles.

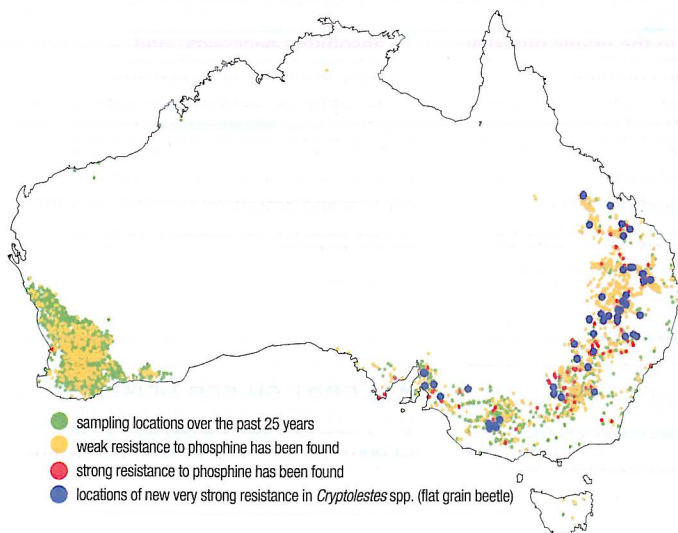
Resistance is assessed using a 'discriminating dose' (DD) method. DDs are concentrations of test chemicals established to discriminate between certain resistance types. Often two doses are used: the first separates susceptible from resistant individuals and is used to test if the insect is resistant; the second dose is used to search for new and significant resistance when an existing resistance is weak or not economically important.

The Australian Grain Insect Resistance Database (AGIRD) continues to be the mainstay for the collation of resistance data. The AGIRD database currently holds data from NSW DPI, QDPI&F and DAFWA for 52,648 assays (46,740 in 2007) on 26,194 strains (22,995 in 2007) from 8559 sites (7771 in 2007). Background information and the AGIRD database can be found at www.agric.wa.gov.au/content/PW/INS/PP/SP/agird.htm. It is fully accessible for data input and querying over the internet.

Under the leadership of the CRCNPB the work of the three laboratories is integrated. If new resistance is detected, it is confirmed by at least one sister laboratory. Inter-laboratory cross-checks are carried out to benchmark the nationally agreed methodology. Quality of results is assured by exchanges between laboratories of reference susceptible and resistant strains and regular meetings/workshops. The three laboratories are developing a common manual for sampling and testing for pesticide resistance. □

THIS RESISTANCE IS THE HIGHEST EVER DETECTED IN AUSTRALIA

FIGURE 1 PHOSPHINE RESISTANCE – THE NATIONAL SITUATION



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