Diamide Insecticides: Protecting Value Today and Into the Future

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Chemical resistance in insects is one of the most significant challenges facing modern agriculture. Resistance occurs when insect populations evolve the ability to survive exposure to chemicals that were previously effective at controlling them. Over time, repeated use of the same style of insecticide (mode of action), places selective pressure on pest insect populations, allowing naturally resistant individuals to survive and reproduce. As these resistant traits become more common, the overall effectiveness of the chemical declines.

An insecticide's mode of action is simply the way it affects the pest to kill it or stop it from causing damage. For example, different insecticides may disrupt an insect's nervous system, stop it feeding, interfere with growth or moulting, or prevent it producing energy. Understanding mode of action is important because using insecticides with the same mode of action too often can increase the risk of resistance developing.

The development of insecticide resistance is a classic example of evolution through natural selection. Within any insect population, there is natural genetic variation. Some individuals may possess mutations or biological characteristics that enable them to detoxify more efficiently, avoid exposure or tolerate toxic effects. When insecticides are applied repeatedly, susceptible insects are eliminated while resistant individuals survive and pass on their genetic traits to the next generation. Given the short life cycles that insects possess, these genetically resistant traits can be rapidly transferred over a short period of time. Eventually, entire populations may become difficult or even impossible to control.

Insecticide resistance continues to shape how pests are managed in Australian cropping systems. At the same time, the rate at which genuinely new insecticide modes of action enter the market has slowed, while regulatory pressure has reduced access to some long-standing chemistries. Together, these factors have increased reliance on a smaller number of effective products.

Geoff Cornwell, FMC's Product Development Manager for Insecticides, has spent more than thirty years working with growers, agronomists and researchers across Australian agriculture. He says the current environment places greater emphasis on how existing tools are used.

"The fewer effective options we have, the more important it is to look after them," he says. "Resistance isn't an abstract issue. When it shows up in the field, it affects crop outcomes and limits future choices."

A changing resistance landscape

Group 28 diamide insecticides are now used more widely across crops as registrations expand. Their strong and consistent performance has made them an important part of many pest management programs. At the same time, broader use brings greater responsibility.

"When one insecticide group becomes widely relied upon, the selection pressure on pests increases," Geoff explains. "That makes resistance management a practical necessity rather than a theoretical discussion." With fewer alternatives available, managing exposure to key modes of action has become central to maintaining long term control.

Why diamides are considered high-value tools

Diamide insecticides are recognised for their consistent control of key lepidopteran pests, favourable safety profile, and fit within integrated pest management (IPM) programs.

That combination supports both crop protection and beneficial insect activity. Their value, Geoff says, is directly linked to how carefully they are used.

“When effective tools lose efficacy, it takes years to recover those lost options, if they can be replaced at all. Good stewardship helps extend the working life of these products.”

The importance of day-to-day decisions

Resistance management relies on a series of practical decisions made throughout the season. These include applying insecticides only once economic thresholds are reached, targeting the most vulnerable pest life stages, and ensuring good application coverage through correct calibration and droplet size.

Following label directions remains critical, particularly limits on the number of applications per crop and per season. Reducing application rates increases the likelihood of resistance selection and undermines product performance.

Protecting beneficial insects also plays an important role. IPM compatible products allow natural enemies to suppress surviving pests and reduce the need for follow up sprays. Reducing pest carry over through crop hygiene further helps limit pressure in the following season. “These are well established principles,” Geoff says. “They apply across crops, regions and insecticide groups.”

Mode of action awareness

Understanding insecticide mode of action groups underpins effective rotation strategies. Rotating between products with the same mode of action does not reduce resistance risk, even if product names differ.

The Insecticide Resistance Action Committee (IRAC) mode of action group numbers are displayed on product labels and packaging, and should be used as a guide for rotation planning. Incorporating mode of action discussions into routine agronomic decision-making supports more effective long-term management.

Managing exposure through treatment windows

For pests with multiple generations within a crop cycle, repeated exposure to the same mode of action increases the risk of resistance over time. Treatment windows are designed to manage that exposure.

A window approach involves using one mode of action for a defined period, then rotating to another group for subsequent applications.

This limits the number of successive generations exposed to the same selection pressure. “Tight windows help preserve efficacy, even when a product is performing well in the short term,” Geoff says.

Applying stewardship principles with Coragen®

Coragen® is a Group 28 diamide insecticide and provides an example of how stewardship recommendations translate into on-farm practice.

Use should align with regional insecticide resistance management strategies and follow a window-based approach. Successive applications may be used within a single pest generation, while exposure of consecutive generations should be avoided.

Label limits should be observed, including a maximum of **three** Coragen® applications per crop, no more than **four** Group 28 applications per season, and total Group 28 exposure limited to **50 per cent** of the crop cycle. Rotation to effective insecticides from other mode of action groups remains essential, alongside IPM practices and regular monitoring of field performance.

Looking ahead

Effective resistance management supports the continued performance of existing insecticides and helps maintain flexibility in future pest control programs.

“Diamide insecticides play an important role in Australian cropping systems,” Geoff says. “Their ongoing value depends on how they are managed today. Careful use helps ensure these tools remain effective for future seasons and future growers.”