KEEP WHAT WORKS WORKING



Mode of Action - what it means and why Group numbers

What is a Mode of Action?

The Mode of Action (MoA) refers to the specific biochemical or physiological process that an active ingredient targets to kill or control a pest.

Pesticides generally act by inhibiting or disrupting these processes in the target pest (Figure 1). Pesticides are classified according to their MoA.

Understanding MoA is important for managing resistance by ensuring products with different MoAs are used in rotation during a growing cycle.

The MoA classification systems for pesticides are essential tools for growers to guide the selection of products to use to manage resistance, so they remain effective, and do not lose efficacy.

Global MoA Classfication System

Fungicides, insecticides and herbicides each have a MoA classification system. MoA groups are designated a number, making it easy to identify if products have the same MoA.

MoA groups are set by the Resistance Action Committees for insecticides (IRAC), fungicides (FRAC) and herbicides (HRAC). Group numbers are sometimes referred to as, for example, the FRAC group. Group numbers help identify if products have the same MoA.

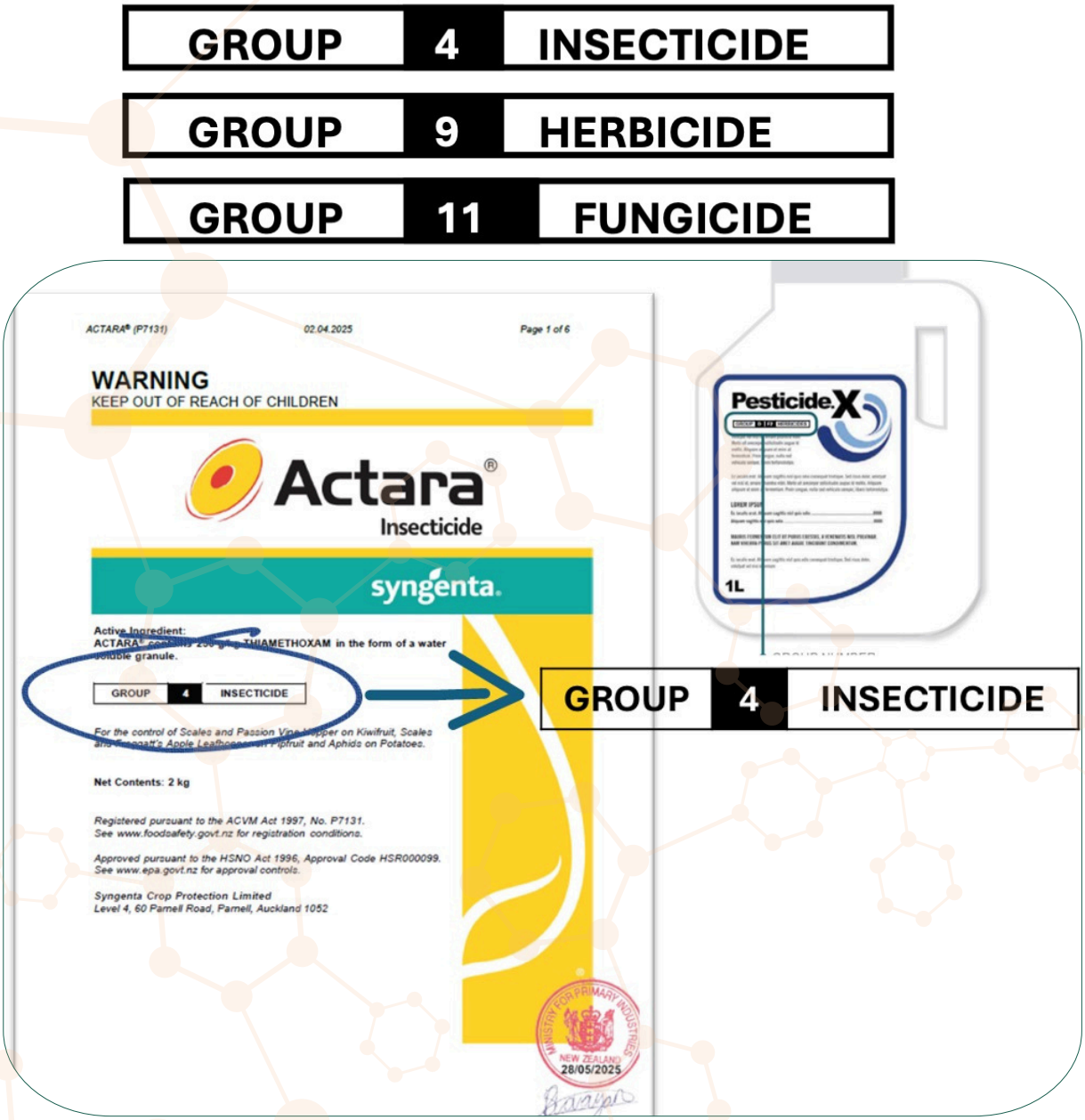
If a product becomes ineffective, a product with the same group number should not be used to target the same pest.

Crop protection products have Group numbers shown on product labels (Figure 2, next page). The group number is used to guide the selection of appropriate products for effective resistance management.

Insecticide MoA	Fungicide MoA	Herbicide MoA
Nervous and muscular system disruptors e.g. Group 1 (OPs), 3 (SPs)	Respiration inhibitors e.g. Group 11 (QoI), 7 (SDHI)	Amino acid synthesis inhibitors e.g. Groups 2, 9, 10
Growth and development regulators e.g. Group 7	Cell membrane disruptors e.g. Group 3 (DMI)	Photosynthesis inhibitors e.g. Groups 5, 6, 7, 22
Energy production inhibitors e.g. Group 12, 13	Cell division inhibitors e.g. Group 1 (MBCs)	Lipid synthesis inhibitors e.g. Group 1
Gut membrane disruptors e.g. Group 11 (Bt)	Nucleic acid synthesis inhibitors e.g. Group 4 (PAs)	Plant growth inhibitors e.g. Group 4
Selective feeding blockers	Amino acid and protein synthesis inhibitors e.g. Group 9 (APs)	Cell membrane disruptors e.g. Group 14, 22
	Multi-site inhibitors e.g. Group M	Pigment inhibitors e.g. Groups 12, 13, 27
		Seedling root and shoot growth inhibitors e.g. Groups 3, 15

Figure 1. Mode of Action of active ingredients in insecticides, fungicides and herbicides.

Figure 2. The chemical Mode of Action (MoA) group for an insecticide, herbicide or fungicide is visible on the front page of a product label. This code helps users rotate products with different MoAs to prevent resistance.



Useful resources



- Insecticide Mode of Action explained
- Fungicide Mode of Action explained
- Herbicide Mode of Action explained

- Companion factsheets are available on '**What is pesticide resistance**? and '**Role of IPM in supporting resistance management**'.

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