

Resistance Management Guidelines for Potatoes

Developed for Potatoes NZ by Lighthouse Horticulture

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WHY IT MATTERS

- ❖ Early blight and several key potato pests have a high resistance risk
- ❖ Sensitivity can change rapidly under repeated selection pressure
- ❖ Resistance is already affecting options here and overseas
- ❖ Very few new modes of action being registered



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New Mechanisms of Resistance to CAA and OSBPI Fungicides in *Phytophthora infestans*

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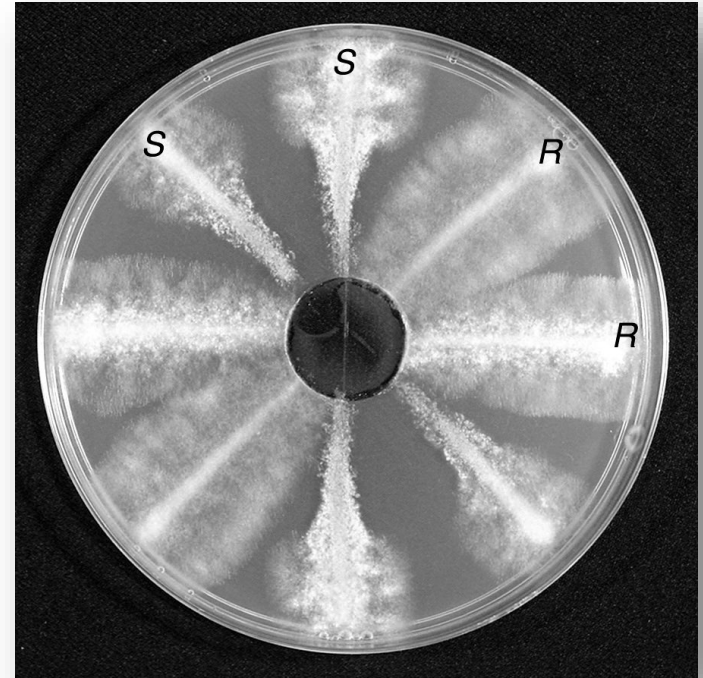


Texas entomologists testing potato psyllids for insecticide resistance

New methods needed for psyllid control Insecticide resistance identified

WHAT'S REQUIRED BY INDUSTRY

- ❖ Proactive resistance management
- ❖ Raising awareness amongst growers
- ❖ Industry-wide agreement on the key rules



WHAT'S HAPPENING IN NZ CONTEXT

- ❖ Historically, the NZ Plant Protection Society has been a wealth of information, guided by a volunteer committee. Less active in recent years – some info now missing/outdated
- ❖ A Lighter Touch has been involved in reinvigorating this space over the past few years, creating some example case studies, updating several resistance management strategies and launched an awareness campaign “Keep What Works Working”
- ❖ The ongoing protection of chemistry for use in crop protection requires sector ownership



Pesticide Resistance Strategies
New Zealand Plant Protection Society (Inc)



WHY RESISTANCE GUIDANCE CAN BE HARD TO USE

- ❖ Often very technically heavy/wordy
- ❖ Multiple sources of information
- ❖ Often a lack of specific information on product labels
- ❖ Generic advice



A POTATO-SPECIFIC RESISTANCE MANAGEMENT FRAMEWORK

- ❖ Synthesise resistance management guidelines across fungicides, insecticides and herbicides into one place
- ❖ Translate generic recommendations into potato-specific guidance
- ❖ Develop practical resources that support grower and advisor decision-making

At Risk Groups

FRAC
GROUP

7

SDHI



MEDIUM TO HIGH RESISTANCE RISK

Cross-resistance occurs across all listed SDHI's

Active Ingredient(s)	Registered Product(s)	Registered Use(s)
Pydiflumetofen	Miravis*	Early blight
Penflurfen	Ernesto Prime	Black scurf
Sedaxane (7) + Fludioxonil (12)	Vibrance Premium	Black scurf; silver scurf; black dot; fusarium dry rot; gangrene; common scab (suppression only)

Group 7 Resistance Management Guidelines

Careful management of SDHI applications is needed to protect this chemistry for use against early blight. Limit SDHI use and strictly follow resistance management guidelines.

Max 3 apps
per year**No more than
2 consecutive

Apply in mixture with an
effective fungicide from a
different mode of action

OTHER CONSIDERATIONS

Due to the high resistance risk
associated with SDHI fungicides,
off-label use is strongly discouraged.

MIRAVIS* – Early Blight Guidelines

- Miravis* should NOT be used in the Franklin area, where a loss of field control has been reported.
- Field performance indicates Miravis* is still effective in Canterbury and Matamata, in adherence with the following resistance management guidelines:
 - Use in strict alternation within a protectant program before disease occurs
 - Always apply in a mixture with another effective fungicide partner registered for early blight

If a SDHI fungicide has been applied as an in-furrow and/or seed treatment, the following should apply.

- The first foliar fungicide application should NOT be an SDHI active ingredient
- A maximum of 2 MIRAVIS* foliar applications can be made during the season.

** While current potato recommendations relate to potato use only, growers should be aware that repeated SDHI exposure across a crop rotation may contribute to overall resistance selection pressure. Always follow product label and EPA restrictions relating to maximum application frequency and re-use intervals.

Insecticide Resistance Management in Potatoes



Why this guide is needed

Repeated use of the same insecticide group can select for resistant individuals within a pest population. Those survivors reproduce, and over time the proportion of resistant insects can increase. This can lead to reduced product performance, field control failures, and fewer effective options for growers.

Three of the main pests in potatoes have been noted as at risk of developing resistance, with resistance already evident for certain broad-spectrum products in aphids and potato tuber moth.

Key Concepts of Insecticide Resistance Management

The following key concepts are based on IRAC guidance and have been adapted to support resistance management decisions in New Zealand potato crops.

The Window Approach

The window approach ensures that the same mode of action is not used across successive pest generations. In the case of potatoes, one window = one pest generation. In the summer months, one window would typically be between 15 and 30 days depending on the target pest, but this will be longer during winter months. This can be achieved through several program designs, as demonstrated in the graphic below.

(A)	MoA _x	MoA _y	MoA _z			MoA _y			STRONGLY RECOMMENDED
(B)	MoA _x	MoA _y	MoA _x			MoA _y			RECOMMENDED
(C)	x	x	y	y	x	y	y		RECOMMENDED
(D)	MoA _x	MoA _x	MoA _y			MoA _y			NOT RECOMMENDED
(E)	MoA _{ab}	MoA _{ab}	MoA _{ab}			MoA _{ab}			NOT RECOMMENDED
	1 st Window	2 nd Window	3 rd Window			4 th Window			

The key concepts are:

- Do not apply insecticides with the same MoA in successive windows
- Following a window of any MoA group, rotate to a window with a different MoA.
- If possible, rotate even more than two MoAs between application windows
- Two applications of the same MoA insecticide are acceptable within a window. Make sure that the residual activity fits within the window.
- Avoid where possible rotating products in different sub-groups of the same MoA.
- The total exposure period of any one mode of action 'active window' applied throughout the crop cycle should not exceed 50% of the crop cycle.

What would help
you apply resistance
management in
practice?



EXAMPLES OF RESOURCES FROM OTHER INDUSTRIES

Fungicide resistance management for black spot 2024

The best resistance management programme is a protective programme that results in no disease, rather a curative one. To prolong the efficacy of at-risk fungicides it is critical industry follows a fungicide resistance management strategy:

Fungicide Group	Active Ingredients	Max per season	Advice to
DMI	• Flusilazole • Difenoconazole • Metconazole • Penconazole	2	DMIs are under a lot of pressure and are showing a general decline in efficacy over time due to resistance development. Penconazole and flusilazole are showing the greatest decline. All four DMIs used at field rates are still expected to provide control. - Minimise the number of applications. - Maximum of 2 applications per season not applied on - DMIs targeting powdery mildew count towards total fi - If applying post infection event (curative), apply as clo - Avoid use after 30 Nov. - Apply in a mix with a multi-site fungicide at its full labe - Use at full label rate and do not apply if severe black sp
SDHI	• Fluxapyroxad • Isopyrazam • Penthiopyrad	4	- Maximum of 4 SDHI's per season. - Use SDHI's preventatively not post infection event. - Alternate applications with a different fungicide group. - Apply in a mix with a multi-site fungicide at its full labe - Use at full label rate and do not apply if severe black spot, has become established.
AP	• Cyprodinil • Pyrimethanil	2	Not typically used to target black spot. But will assist black spot control when applied for other pathogens. High black spot resistance to APs is prevalent in the Nelson/Tasman region. - Do not use APs in Nelson/Tasman for black spot control. - Maximum of 2 applications per season. - Apply in a mix with a multi-site fungicide at its full label rate. - Avoid consecutive applications where possible. - Use at full label rate and do not apply if severe black spot has become established.
QoI	• Trifloxystrobin		Use not recommended for black spot control due to widespread resistance.
Guanidine	• Dodine	4	- Max of 4 applications per season. - No more than 2 consecutive applications. - Use at full label rate. - Do not apply if severe black spot has become established.

Severe black spot establishment: assessment per block: if > 1% of fruit or leaves are infected, use at-risk fungicides with caution; if > 5% fruit or leaves infected, do not use at-risk fungicides.

Key black spot management practices that will reduce fungicide resistance developing:

- Following the resistance management guidelines
- Using the right chemical at the right time
- Ensuring good spray coverage and confirming spray is hitting the tops of trees
- Using sanitation treatments to reduce inoculum load

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Resistance survey for *Monilinia* sensitivity (from Elmer et al. 2019, Wood et al. 2025)

FRAC code	MOA group	Active ingredient	Trade name	Resistance risk	Resistance management guidelines (2024)*
1	methyl benzimidazole carbamates (MBC)	carbendazim	Various e.g. Protek, Prolific®, Chief	Low/Medium	1x application per season. Use during blossom period only.
2	dicarboximide (DCA)	iprodione	Rovral Aquafl®, Ippon 500SC, Rapid 500	Low/Medium High frequency of reduced sensitivity	3x applications per season. Best used as a preventative only. Do not use where disease has become established. Preferred use period is pre-harvest.
3	demethylation inhibitors (DMI)	tebuconazole	various e.g. Folicur® WG, Hornet 430SC, Compass	High	2x applications per season. Use in only one part of the growing season, either during flowering or pre-harvest. Apply with an effective protectant fungicide. Do not use DMIs against brown rot if resistance is suspected.
7 +11	succinate dehydrogenase inhibitor (SDHI) + quinone outside inhibitors (QoI)	boscalid + pyraclostrobin	Pristine®	Low/Medium SDHI actives have a medium risk	2x applications per season. Preferably use in a mixture. If used alone, apply in strict alternation with an effective protectant fungicide. Pristine use restricted to pre-shuck fall in apricot, nectarine, peach & plum.
	SDHI + QoI	fluopyram + trifloxystrobin	Luna® Sensation	SDHI actives	2x applications per season. Preferably use in a mixture.

