

Insecticide Resistance Management Strategy 2020/21

Best Practice Product Windows and use Restrictions to Manage Insecticide Resistance in Insect Pests of Australian Cotton

NORTHERN REGIONS: Belyando, Callide, Central Highlands, Dawson

INCREASING

SELECTIVITY

DECREASING

CONSIDER IMPACT ON BENEFICIALS & BEES (Table 1 CPM/G)

Stage 1	Stage 2	Stage 3	Stage 4
	1-Nov	1-Dec	1-Jan
Helicoverpa viruses (Virus)			
Pirimicarb Group 1A			Note 1
Paraffinic Oil (Canopy, Biopest)			
		Pyriproxyfen Group 7C	Use an alternative from open cotton
Sero-X			
Etoxazole			
Buprofezin (Applaud) Group 16			Note 11
	GROUP 28: Max 4/season	Chlorantraniliprole (Altacor) Group 28	
Afidopyropen (Versys) Group 9D			
Spinetoram (Success Neo) Group 5			
start date = canopy closure		Diafenthiuron Group 12A	
Pymetrozine Group 9B			
Indoxacarb Group 22A			Dec-31
	GROUP 28: Max 4/season	Cyantraniliprole (Exirel) Group 28	
Spirotetramat (Movento) Group 23			
Fonicamid (MainMan) Group 29			
Abamectin Group 6			GROUP 6: Max 3 / season
Emamectin Group 6			
start date = squaring		Propargite Group 12C	
Amitraz Group 19			
Sulfoxaflor (Transform) Group 4C			
Fipronil Group 2B		Refer to label statement about bees	
Neonicotinoids (acetamiprid, clothianidin, dinotefuran, imidacloprid, thiamethoxam) Group 4A			
			Chlorantraniliprole +Thiamethoxam (Voliam Flexi) Group 4A + Group 28
Acetamiprid + Emamectin (Skope) Group 4A + Group 6			
Phorate	Note 1	Feb-01	Carbamates (methomyl, thiodicarb) Group 1A
			Dimethoate Group 1B
			OPs (chlorpyrifos, methidathion) Group 1B
			Synthetic Pyrethroids Group 3A

Legend:

- Avoid repeated use of same group
- No more than 1 application
- No more than 2 applications
- No more than 3 applications
- No more than 4 applications

Note 1 If a phorate side dressing is used at planting then do not use a pirimicarb or dimethoate first foliar spray as there is cross resistance between them all. Dimethoate use will select catastrophic pirimicarb resistance in aphids so do not use pirimicarb and dimethoate in the same field.

Note 2 Failures of neonicotinoids against aphids have been confirmed. DO NOT follow a neonicotinoid seed treatment with a foliar neonicotinoid when aphids are present. If there is an alternative do not follow a neonicotinoid with sulfoxaflor.

Note 3 Cross check with Silverleaf Whitefly Threshold Matrix in the 2020/21 Cotton Pest Management Guide.

Note 4 Imidacloprid (neonicotinoid) resistance in cotton seedling thrips is likely. If resistance is suspected, phorate is an appropriate at-planting alternative. Consider non-neonicotinoid alternatives for first foliar spray.

Note 5 Additional applications can be made if targeting *Helicoverpa* moths using Magnet.

Note 6 Sprayed conventional cotton crops defoliated after March 9 are more likely to harbour diapausing *Helicoverpa armigera* and should be pupae busted as soon as possible after harvest and no later than the end of August to reduce resistance risk.

Note 7 High resistance is present in *Helicoverpa armigera* populations. Expect field failures. Low resistance is present in SLW.

Note 8 Addition of abamectin to mirid sprays has caused high level resistance in mites. Base miticide decisions on thresholds only.

Note 9 Resistance to pyriproxyfen has not been detected in CQ despite a long history of use. As such a regional pyriproxyfen window has not been required. Given the long growing period and emerging issues of indoxacarb resistance in *Helicoverpa armigera* and detection of Spirotetramat resistance in SLW in CQ, area wide coordination across crop types for pest management and continued adoption of IPM is encouraged.

Note 10 Rare and low level resistance to spirotetramat has been detected in Emerald. The dominant target site resistance mechanism means resistance can develop rapidly and reversal of resistance is unlikely.

Note 11 Buprofezin usage is allowable for mealybug in cotton under permit. Maximum of 2 sprays per field.

ALWAYS FOLLOW LABEL DIRECTIONS
CONSIDER IMPACT ON BENEFICIALS & BEES; (TABLE 3, COTTON PEST MANAGEMENT GUIDE)
IMPLEMENT AN IPM STRATEGY INCLUDING GOOD FARM HYGIENE AND CONTROL OF OVERWINTER HOSTS.
PUPAE BUST AFTER HARVEST

Insecticide Resistance Management Strategy 2020/21

Best Practice Product Windows and use Restrictions to Manage Insecticide Resistance in Insect Pests of Australian Cotton

CENTRAL & SOUTHERN REGIONS: Balonne, Bourke, Darling Downs, Gwydir, Lachlan, Upper & Lower Namoi, MacIntyre, Macquarie, Murrumbidgee, Murray

INCREASING
SELECTIVITY
DECREASING
CONSIDER IMPACT ON BENEFICIALS & BEES (Table 1 CPMG)

Stage 1	Stage 2	Stage 3	Stage 4		
	15-Dec	15-Jan	15-Feb		
Helicoverpa viruses (Virus)					
Pirimicarb Group 1A				Note 1	
Paraffinic Oil (Canopy, Biopest)					
	Pyriproxyfen Group 7C Regional 30 day window		Use an alternative from open cotton	Note 3, 9	
Sero-X					
Etoxazole					
Buprofezin (Applaud) Group 16				Note 11	
	GROUP 28: Max 4/season	Chlorantranilprole (Altacor) Group 28			
Afidopyropen (Versys) Group 9D					
Spinetoram (Success Neo) Group 5					
start date = canopy closure		Diafenthiuron Group 12A			Note 3
Pymetrozine Group 9B					
Indoxacarb Group 22A			Jan-31		
	GROUP 28: Max 4/season	Cyantranilprole (Exirel) Group 28			
Spirotetramat (Movento) Group 23					Note 3, 10
Flonicamid (MainMan) Group 29					
Abamectin Group 6			GROUP 6: Max 3 / season	Note 8	
Emamectin Group 6					
start date = squaring		Propargite Group 12C			
Amitraz Group 19					
Sulfoxaflor (Transform) Group 4C					Note 2
Fipronil Group 2B					Residual bee risk
Refer to label statement about bees					
Neonicotinoids (acetamiprid, clothianidin, dinotefuran, imidacloprid, thiamethoxam) Group 4A					Note 2, 4
Chlorantranilprole +Thiamethoxam (Voliam Flexi) Group 4A + Group 28					} Consider risk to each group
Acetamiprid + Emamectin (Skope) Group 4A + Group 6					
Phorate	Note 1			Note 5	
		Feb-01		Note 1	
			Carbamates (methomyl, thiodicarb) Group 1A		
			Dimethoate Group 1B		
			OPs (chlorpyrifos, methidathion) Group 1B		
			Synthetic Pyrethroids Group 3A	Note 3, 7	

- Avoid repeated use of same group
- No more than 1 application
- No more than 2 applications
- No more than 3 applications
- No more than 4 applications

Note 1 If a phorate side dressing is used at planting then do not use a pirimicarb or dimethoate first foliar spray as there is cross resistance between them all. Dimethoate use will select catastrophic pirimicarb resistance in aphids so do not use pirimicarb and dimethoate in the same field.

Note 2 Failures of neonicotinoids against aphids have been confirmed. DO NOT follow a neonicotinoid seed treatment with a foliar neonicotinoid when aphids are present. If there is an alternative do not follow a neonicotinoid with sulfoxaflor.

Note 3 Cross check with Silverleaf Whitely Threshold Matrix in the 2020/21 Cotton Pest Management Guide.

Note 4 Imidacloprid (neonicotinoid) resistance in cotton seedling thrips is likely. If resistance is suspected, phorate is an appropriate at-planting alternative. Consider non-neonicotinoid alternatives for first foliar spray.

Note 5 Additional applications can be made if targeting Helicoverpa moths using Magnet.

Note 6 Sprayed conventional cotton crops defoliated after March 9 are more likely to harbour diapausing Helicoverpa armigera and should be pupae busted as soon as possible after harvest and no later than the end of August to reduce resistance risk.

Note 7 High resistance is present in Helicoverpa armigera populations. Expect field failures. Low resistance is present in SLW.

Note 8 Addition of abamectin to mirid sprays has caused high level resistance in mites. Base miticide decisions on thresholds only.

Note 9 Resistance to pyriproxyfen is now widespread. To avoid complete loss of product efficacy, adhere to the 30 day regional window. Limit pyriproxyfen use to no more than 1 application per season.

Note 10 Rare and low level resistance to spirotetramat has been detected in Emerald. The dominant target site resistance mechanism means resistance can develop rapidly and reversal of resistance is unlikely.

Note 11 Buprofezin usage is allowable for mealybug in cotton under permit. Maximum of 2 sprays per field.

ALWAYS FOLLOW LABEL DIRECTIONS

CONSIDER IMPACT ON BENEFICIALS & BEES; (TABLE 3, COTTON PEST MANAGEMENT GUIDE)

IMPLEMENT AN IPM STRATEGY INCLUDING GOOD FARM HYGIENE AND CONTROL OF OVERWINTER HOSTS.

PUPAE BUST AFTER HARVEST



IRMS Guidelines

In every population of every pest species there is a small proportion of individuals with resistance to an insecticide. The use of an insecticide controls the susceptible insects, leaving behind resistant individuals. These resistant individuals can then build up as a larger proportion of the population. Over-reliance on an insecticide can lead to an increase in the proportion of resistant individuals to the point that the insecticide fails to provide satisfactory control. This simple scenario is more complex in a field situation as products applied against a target pest not only selects for resistance in that pest but in other pests also present at the same time. The IRMS aims to assist users to:

- Lower the risk of inadvertent selection of resistance in pests that are not the primary target of the insecticide application.
- Delay the evolution of pest resistance to key chemical groups, by minimising the survival of individuals with resistance.
- Manage entrenched resistance problems, such as the now widespread resistance in SLW to pyriproxyfen.

The IRMS includes all actives commercially available for use in cotton at the time of publication. The IRMS should be consulted for EVERY insecticide/miticide decision.

Principles underlying the IRMS

- Monitor pest and beneficial populations.
- Monitor fruit retention.
- Use recommended thresholds for all pests.
- For all pest species, aim to use the most selective insecticide options first, delaying the use of broad spectrum insecticides for as long as possible.
- Comply with all directions for use on product labels.
- Avoid repeated applications of products from the same insecticide group, even when targeting different pests. Rotate between groups.
- Do not respray an apparent failure with the same product or another product from the same insecticide group. Rotate to a different group.
- Control weeds and cotton volunteers in fields and around the farm all year to minimise pest hosts.
- Pupae bust cotton as soon as possible after harvest.

How to use the 2020-21 IRMS

Region

There are two IRMS regions. Central and Southern Regions have been combined. The Northern Region covers Central Qld where stage dates accounts for the early planting and quicker crop development.

Stage

The dates shown on the strategy charts are for the start of each stage (e.g. 15 December is the start of Stage 2 for Central & Southern region). For those individual insecticides and miticides that start or end outside window boundaries, the start &/or end dates are listed.

Selectivity

The products listed in the IRMS are listed in order of decreasing selectivity. For all pest species, aim to use the most selective option, delaying or avoiding the use of broad spectrum insecticides.

Use restrictions

Colours in the table represent the maximum number of applications per crop per season for any given product. Additional restrictions to product use can be found on the right hand column of the table, with links to specific footnotes. Avoid repeated applications of products from the same insecticide group, even when targeting different pests. Rotate between groups.

Insecticide Resistance Management Strategies in grains

Resistance management strategies have been developed for four key grains pests: *Helicoverpa armigera*, Green peach aphid, Red Legged Earth Mite and Diamond Back Moth. These strategies should be used in conjunction with the Cotton IRMS and are available at <https://ipmguidelinesforgrains.com.au/ipm-information/resistance-management-strategies/>. For other resistance management strategies and list of insecticide MOA groups refer to CropLife Resistance Management webpage: <https://www.croplife.org.au/resources/programs/resistance-management/>

Key Changes for the 2020-21 cotton season

- **Continuation of Pyriproxyfen window.** Resistance to Pyriproxyfen in SLW is a significant concern for industry. In an effort to maintain product efficacy TIMS has recommended a continuation of the regional 30 day pyriproxyfen window and restrictions on pyriproxyfen use in open cotton. The TIMS committee will again work with each region to identify an appropriate window and these dates will be published on CottonInfo and Cotton Australia websites. Limit Pyriproxyfen use to no more than ONE application per season. Refer to the SLW Threshold Matrix when making SLW control decisions. IPM, including removal of winter hosts and preserving beneficials is critical to supporting SLW resistance management.
- **One Spirotetramat application per season.** Rare and low level resistance to spirotetramat has been detected in Emerald. The dominant target site resistance mechanism means resistance can develop rapidly and reversal of resistance is unlikely. With pyriproxyfen resistance remaining a concern, and increased reliance on spirotetramat, TIMS has recommended usage be limited to one application per season. The 'double knock' use for mealybug – 2 applications 14 days apart is an allowable exception.
- **Inclusion of Buprofezin.** Buprofezin usage is allowable under permit for mealybug suppression. Permit allows one foliar treatment per crop.
- **Fipronil bee risk.** While bees are susceptible to many insecticides used on cotton, fipronil risk to managed hives has been highlighted due to the extended residue risk. Refer to label for statement about bees

In-season troubleshooting

Ratification of the IRMS prior to the start of each season is the responsibility of Cotton Australia's TIMS Committee. A Troubleshooting sub-committee is empowered to act on TIMS' behalf during the cotton season to respond to emergency requests to vary the IRMS. For further information contact Cotton Australia (02 9669 5222).

TABLE 19: Insecticide groups with resistance rating

Active ingredient (proprietary trade names)	Insecticide group	Chemical group	Resistance rating
<i>Helicoverpa virescens</i> (Gemstar, VIVUS Max)	Not a member of a group	Nucleopolyhedrovirus NPV	L
Paraffinic Oil (Canopy, Biopest)	Not a member of a group	Petroleum spray oil	L
Dicofol	Not a member of a group	UN – Unknown mode of action	L
Amorphous silica (Abrade)	Not a member of a group	Not a member of a group	L
Methomyl Pirimicarb Thiodicarb	GROUP 1A INSECTICIDE	Carbamate\	H
Chlorpyrifos Dimethoate Methidathion Phorate	GROUP 1B INSECTICIDE	Organophosphates	M
Fipronil	GROUP 2B INSECTICIDE	Phenylpyrazoles (Fiproles)	M
Alpha-cypermethrin Beta-cyfluthrin Bifenthrin Cypermethrin Deltamethrin Gamma-cyhalothrin Lambda-cyhalothrin Zeta-cypermethrin	GROUP 3A INSECTICIDE	Synthetic Pyrethroids	H
Acetamiprid (Intruder, Scope#) Clothianidin (Shield) Imidacloprid (multiple, includes seed treatments) Dinotefuran (Starkle) Thiamethoxam (multiple, includes seed treatments Voliam Flexi#)	GROUP 4A INSECTICIDE	Neonicotinoids	M
Sulfoxaflor (Transform)	GROUP 4C INSECTICIDE	Sulfoximine	L
Spinetoram (Success Neo, Spinosad)	GROUP 5 INSECTICIDE	Spinosyns	L
Abamectin Emamectin (Affirm, Scope#)	GROUP 6 INSECTICIDE	Avermectins	H abamectin L emamectin
Pyriproxyfen (Admiral, Avante, Lascar, Muligan)	GROUP 7C INSECTICIDE	Pyriproxyfen	H
Pymetrozine (Chess)	GROUP 9B INSECTICIDE	Pymetrozine	L
Afidopyropen (Versys)	GROUP 9D INSECTICIDE	Afidopyropen	L
Fonicamid (MainMan)	GROUP 29 INSECTICIDE	Fonicamid	L
Etoxazole	GROUP 10B INSECTICIDE	Etoxazole	L
Foliar <i>Bacillus thuringiensis</i> (Dipel)	GROUP 11 INSECTICIDE	Bt microbials	M
Diafenthiuron (Pegasus, Receptor, Aphinox)	GROUP 12A INSECTICIDE	Diafenthiuron	L
Propargite	GROUP 12C INSECTICIDE	Propargite	L
Amitraz	GROUP 19 INSECTICIDE	Amitraz	L
Buprofezin	GROUP 16 INSECTICIDE	Buprofezin	
Indoxacarb	GROUP 22A INSECTICIDE	Indoxacarb	H
Spirotetramat	GROUP 23 INSECTICIDE	Spirotetramat	M
Chlorantraniliprole (Altacor) (Voliam Flexi#) Cyantraniliprole (Exirel)	GROUP 28 INSECTICIDE	Diamides	H

#Voliam Flexi has actives from both Group 28 and Group 4A.

* Skope has actives from both Group 4A + Group 6 insecticide

Source: CropLife Australia Insecticide Resistance Management Review Group, 2016; <http://www.croplifeaustralia.org.au/>