



TOPDRAIN®

TECHNICAL MANUAL



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TROJAN® INSECTICIDE IS THE MOST POTENT PYRETHROID INSECTICIDE AVAILABLE IN THE WORLD

Trojan® Insecticide's unique microcapsule formulation gives it an excellent safety profile and ensures the

widest range of tank mix compatibility. Trojan® is a 150g/L formulation of gamma-cyhalothrin.

HISTORY OF TROJAN® INSECTICIDE

1999	Process patent filed by Cheminova
2000	Pytech Chemicals Gmb (Swiss) established as a joint venture company owned 50/50 by Cheminova and Dow AgroSciences to develop, register and market gamma-cyhalothrin globally
2004	Australian launch of Trojan® Insecticide by Dow AgroSciences
2008	Cheminova purchases Dow AgroSciences' share of Pytech and takes 100% ownership
2008	Dow AgroSciences is granted ongoing exclusively distribution rights in Australia.
Early 2015	FMC acquires Cheminova
End 2015	FMC Australasia discontinues the Dow AgroSciences distribution agreement
2016	FMC first sales of Trojan® in Australia

TECHNICAL

Gamma-cyhalothrin, the active ingredient in Trojan® Insecticide, is a single stereoisomer alpha-cyano pyrethroid that is generally regarded to be most potent pyrethroid insecticide available in the world. It is manufactured using a novel patented chemical process invented by Cheminova in the late 1990s.

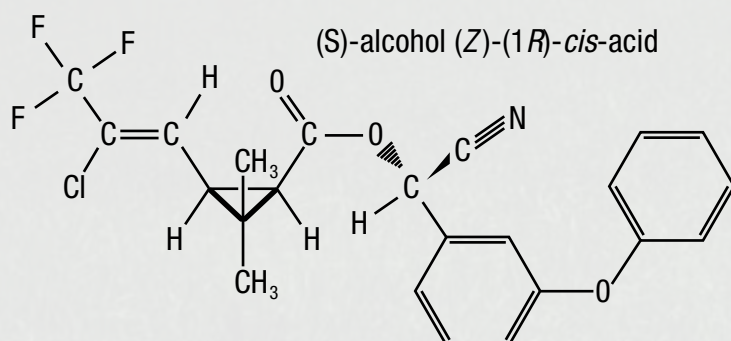
Gamma-cyhalothrin is a single stereoisomer of the pyrethroid insecticide cyhalothrin, and as such shares physical, chemical, and biological properties with both cyhalothrin and lambda-cyhalothrin, which are mixtures of 4 and 2 isomers

respectively. Gamma-cyhalothrin is the most insecticidally active isomer of cyhalothrin/lambda-cyhalothrin, and thus the technical gamma-cyhalothrin product may be considered a refined form of cyhalothrin/lambda-cyhalothrin in that it has been purified by removal of less active and inactive isomers. Thus, similar levels of insecticidal efficacy for gamma-cyhalothrin can be obtained with significantly reduced application rates as compared with either cyhalothrin or lambda-cyhalothrin.

THE ACTIVE INGREDIENT

Active Ingredient	<i>Gamma-cyhalothrin</i> , a single stereoisomer alpha-cyano pyrethroid. The most potent pyrethroid insecticide available in the world.
Chemical Formula	C ₂₃ H ₁₉ C ₁ F ₃ N ₀ 3
IUPAC Name	(S)-α-cyano-3-phenoxybenzyl (1R)-3-[(Z)-2-chloro-3,3,3-trifluoropropenyl]-2,2-dimethylcyclopropanecarboxylate

CHEMICAL STRUCTURE



MAJOR USE PATTERNS

CEREALS Crop Establishment

Early establishment of cereal crops, targeting aphid antifeed and general broad spectrum pest control. Low input segment where alpha-cypermethrin is commonly used.

Trojan® Insecticide's unique microcapsule formulation gives:

- Excellent tank mix compatibility and crop safety with no added crop burn even when mixed with herbicides, fungicides, UAN and trace elements;
- Extended residual control of insects compared to alpha-cypermethrin;
- The ultra-low dose makes it really easy and safe to use, 5 Litres of Trojan® treats up to 500 ha of crop; and
- As the only "Schedule 5" pyrethroid it's much safer to handle and has significantly reduced risk of the nasty itch and burn of skin that's often associated with alpha-cypermethrin product.



Figure 1: Red Legged Earth Mite on Canola

GRAIN LEGUMES, CANOLA Late Season

Late season control of native budworm and other chewing pests of grain legumes and canola crops.

Trojan® Insecticide's unique microcapsule formulation means:

- As the only "Schedule 5" pyrethroid, Trojan® is much safer to handle and has significantly reduced risk of the nasty itch and burn of skin that's often associated with alpha-cypermethrin and other products;
- The ultra-low dose makes it really easy and convenient to use, 5 Litres treats up to 250 ha of crop; and
- Short withholding periods (7-14 days) means it can be used close to harvest when late season insect control is often needed.

It is registered on all grain legumes including lentils and vetch.



Figure 2: Aphids on wheat

CANOLA Crop Establishment

Early establishment of canola crops, targeting mites (Balaustium, Bryobia, RLEM and blue oat mites) and broadspectrum pest control.

Trojan® Insecticide's unique microcapsule formulation gives:

- Broadspectrum control of all key pest of Canola with Extended residual control of insects compared to alpha-cypermethrin;
- The ultra-low dose makes it really easy and safe to use, 5 Litres of Trojan® treats up to 500 ha of crop; and
- As the only "Schedule 5" pyrethroid it's much safer to handle and has significantly reduced risk of the nasty itch and burn of skin that's often associated with alpha-cypermethrin products.

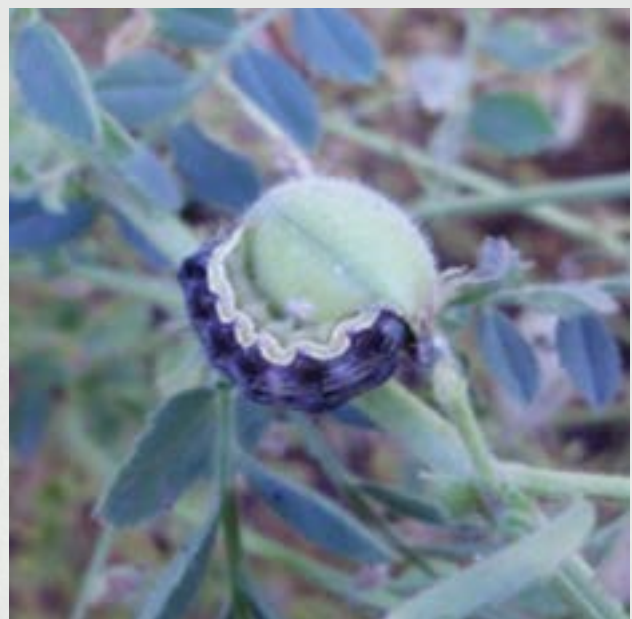


Figure 3: Helicoverpa spp. on Chick Pea

TROJAN® INSECTICIDE (150 G/L GAMMA-CYHALOTHRIN MICROCAPSULE SUSPENSION) IS A FIFTH GENERATION SINGLE STEREOISOMER ALPHA-CYANO PYRETHROID.

Trojan® Insecticide is manufactured in Denmark using a novel patented chemical process invented by Cheminova.

Features	Benefits
Less Pyrethroid Face Burn (Paraesthesia)	<ul style="list-style-type: none"> • Only S5 pyrethroid on the market • Significantly reduced risk of face burn (paraesthesia) • Unprotected re-entry period is once spray is dry, significantly less than alpha-cypermethrin
Low Dose Rate	<ul style="list-style-type: none"> • Typically 1/10th of those of alpha-cypermethrin 100 EC or SumiAlpha™ Flex which means several 20 L containers can be replaced with just one 5 L pack of Trojan® • 5 litres can treat up to 625 ha • Reduced cost of transport and storage
Small Packs	<ul style="list-style-type: none"> • 1 L and 5 L are easy to handle • OH&S benefit as the smaller quantities are easier to handle
Short Withholding Periods	<ul style="list-style-type: none"> • Short withholding periods, allows use closer to harvest • Beneficial when treating grain legumes and canola for native budworm close to harvest
Low Crop Damage	<ul style="list-style-type: none"> • Low solvent load in formulation • No added crop burn
Broad Spectrum Control	<ul style="list-style-type: none"> • Excellent control of establishment pests • The only pyrethroid needed on farm
Registered on Target Crop	<ul style="list-style-type: none"> • Broad label claims • Registered on all key crops and pastures, including lentils and vetch
Excellent Tank Mix Compatibility	<ul style="list-style-type: none"> • Excellent tank mix compatibility with herbicides, fungicides, trace elements and UAN
Advanced Microcapsule Formulation	<ul style="list-style-type: none"> • 30 minute rainfastness, the shortest in the market • Controlled release leading to extended residual control

TROJAN® INSECTICIDE IS THE MOST POTENT PYRETHROID INSECTICIDE AVAILABLE IN THE WORLD.

PATENT

Gamma-cyhalothrin is manufactured using a patented chemical process. The patent describes a process for the preparation of cyclopropane carboxylic acid compounds that produces only the 1 R, cis stereo-isomer, the most insecticidally active of pyrethroid isomers. The process enables the manufacture of the single stereo-isomer in a manner that is both technically and economically attractive, minimising the applied dose of active ingredient.

FORMULATION

Trojan® offers both fast knockdown and extended control of insect pests. Initial control of established pest populations occurs primarily through direct contact of the insect pests with collapsing microcapsules. The larger capsules remain intact, gradually releasing the gamma-cyhalothrin over time giving long lasting control

Trojan® is produced using microcapsule suspension formulation technology giving consistent high performance, offering excellent rain-fastness, temperature tolerance, increased residual activity, very low dose rates, low volatility and non-flammability improving the ease of handling, use and transportation.

IMPROVED USER SAFETY

As a highly potent product, the microcapsule provides controlled release of the active ingredient offering reduced toxicity to operators and significantly reduced risk of pyrethroid paraesthesia (itching and burning of skin) that is an unpleasant side effect of many other pyrethroid insecticides.

Trojan® Insecticide is the only Schedule 5 (Caution signal heading) synthetic pyrethroid registered in Australia for use in broad acre cropping.

COMPATABILITY AND CROP SAFETY

The low solvent load in the formulation means Trojan® offers outstanding tank mix compatibility without increased risk of crop phytotoxicity.

Over 60 mix partners have been evaluated in the lab and Trojan® has been shown to be compatible with:

- All herbicides, insecticides, and fungicides that were tested (including glyphosate)
- All formulation types (EC, WDG, WP, SC, SL, etc.) that were tested
- UAN Fertilisers
- Surfactants and emulsifiable oils
- Crop oil concentrate and mentholated sunflower oil

Note that Trojan® has been shown to be incompatible with non-emulsifiable oils (diesel, mineral oil etc.); 10-34-0 fertiliser and solutions containing boron.

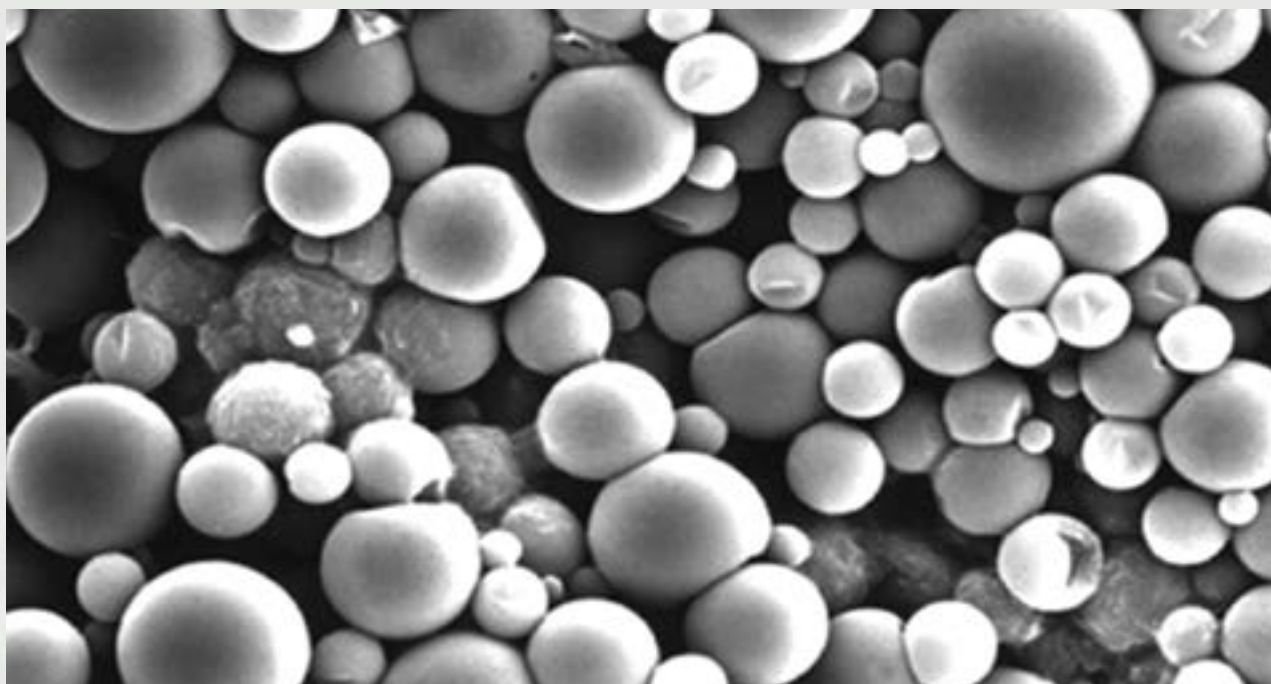


Figure 4: Electron Micrograph of the Trojan® microcapsule

COMPETITIVE ADVANTAGE

Attribute	Trojan	Alpha-cypermethrin 100EC	Alpha Forte 250SC	Sumi Alpha Flex
Active	Gamma-cyhalothrin	Alpha-cypermethrin	Alpha-cypermethrin	Esfenvalerate
Formulation	150 g/L CS	100 g/L EC	250 g/L SC	50 g/L EC
Manufacturer	FMC	Generic	Generic	Sumitomo
Number of registrants	1	32	7	1
Poison Schedule	S5	S6	S6	S6
Use rates (easy to handle)	8 - 70 mL/ha	50 - 500 mL/ha	20 - 200 mL/ha	50 - 500 mL/ha
Flammability	No	Flammable	No	No
Re-entry period	Once spray is dry	12 hours	12 hours	Not stated
Rainfastness	30 minutes	6 hours	6 hours	6 hours
Harvest Withholding Periods (days)				
Canola	7	21	21	14
Chickpeas	7	21	21	14
Field Peas	7	28	28	14
Faba beans	7	28	28	14
Lentils	7	Not registered	Not registered	14
Vetch	7	Not registered	Not registered	14
Cereals	14	7	7	7
Lupins	14	28	28	14
Pasture	14	14	14	7
No Crop Burn	Yes	No	Yes	No
Compatibility	Good	Fair	Good	Fair
Reduced paraesthesia (skin burn)	Yes	No	No	No
Price (\$/L)	\$90.00	\$7.00	\$17.50	\$9.50
Typical use rates (\$/ha)				
RLEM (pre-em)	\$0.72	\$0.70	\$0.70	\$0.95
Aphid antifeed	\$0.90	\$0.88	\$0.88	\$0.95
Caterpillars (Grubs) etc	\$1.80	\$1.75	\$1.75	\$1.90

WITHHOLDING PERIODS

HARVESTING:

Tomatoes	Do not harvest for 1 day after application.
Cabbage, Cauliflower, Brussels Sprouts, Broccoli	Do not harvest for 2 days after application.
Peas, canola, Faba beans, Chick peas, Vetch, Potatoes	Do not harvest for 7 days after application.
Lupins, Sorghum, Mung beans, Navy beans, Barley, Wheat, Pasture, Lentils	Do not harvest for 14 days after application.
Cotton, Soybeans	Do not harvest for 21 days after application.
Sunflower, Oranges, Lemons	Do not harvest for 4 weeks after application.

GRAZING AND CUTTING FOR STOCKFEED*:

Forage brassicas	Do not graze or cut for stock food for 2 days after application.
Field peas, Canola, Faba beans, Chick peas, Vetch	Do not graze or cut for stock food for 7 days after application.
Lupins, Sorghum, Navy beans, Mung beans, Barley, Wheat, Pasture, Lucerne, Lentils	Do not graze or cut for stock food for 14 days after application.
Soybeans	do not graze or cut for stock food for 21 days after application

*Please consult the label for specific comments regarding cutting crops and grazing for stock feed.

RESISTANCE MANAGEMENT

For insecticide resistance management Trojan® Insecticide is a Group 3A insecticide. Some naturally occurring insect biotypes resistance to Trojan® Insecticide and other Group 3A insecticides may exist through normal genetic variability in any insect population. The resistant individuals can eventually dominate the insect population if Trojan® Insecticide or other Group 3A insecticides are

used repeatedly. The effectiveness of Trojan® Insecticide on resistant individuals could be significantly reduced. Since occurrence of resistant individuals is difficult to detect prior to use, FMC Australasia Pty Ltd accepts no liability for any losses that may result from the failure of Trojan® Insecticide to control resistant insects.



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