What is Malice Duo Advanced Miticide

- Malice Duo Advanced Miticide is a dual active miticide, containing the active ingredients abamectin, 18g/L and clofentezine, 187.5g/L.
- Malice Duo Advanced Miticide is a suspension concentrate formulation.
- Malice Duo Advanced Miticide is registered for the control of Couch Mite in all turf situations.
- Malice Duo Advanced Miticide has been developed and manufactured in Australia.

Abamectin Mode of Action

Group	10A	6	Insecticide

- Abamectin blocks the transmission of electrical activity in invertebrate nerve and muscle cells mostly by enhancing the effects of glutamate (an important inhibitory neurotransmitter in insects) at the glutamate-gated chloride channel.
- By activating glutamate-gated chloride channels, the mite becomes paralysed, stops feeding and dies. Abamectin has contact toxicity, but its stomach toxicity is much stronger.
- After 2-3 days of spraying abamectin, its insecticidal efficacy will be best and the longevity of residues will last about 7-15 days.
- Abamectin moves via translaminar activity (one side of leaf to the other) to kill mites that hide in the internal leaf sheath's.

Group	10A	6	Insecticide

Clofentezine Mode of Action

- Clofentezine is a specific acaricide with contact action, and long residual activity.
- It acts primarily by interfering with cell growth and differentiation during the final stages of embryonic (ovicide), and early larval development.
- IRAC (Insecticide Resistance Action committee) class Clofentezine as an insect or acaricide growth regulator. Clofentezine mimics growth hormones by directly affecting cuticle formation or lipid biosynthesis, halting their ability to develop any further and essentially preventing their lifecycle completion (IRAC, 2016).

Key Application Information

- Apply by ground boom sprayer, low pressure hand wand or hand gun sprayer. To be effective Malice Duo Advanced requires thorough spray coverage.
- Ensure that equipment is properly calibrated to give an even distribution at the correct volume.
- Application volume should be adequate to ensure thorough and even coverage of turf leaves with penetration into the crowns. Total application volume should be 400 - 800 L/ha. Use coarse droplets (e.g. Air Induction flat fan 025 to 04 nozzles).
- In higher cut turf (>15 mm) a significant spray shielding effect can occur, impacting negatively on spray penetration and even coverage at low application volumes.
- Don’t apply to turf under heat or moisture stress.
- Don’t apply if rainfall imminent. The effect of this product could be diminished if rain falls within 6 hours of application.
- Don’t apply through any type of irrigation system or ultra low volume spray system.
- Don’t apply with a nozzle height greater than 50 cm above the ground.

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Bee Safety

Abamectin is highly toxic to bees. Don’t spray while bees are actively foraging. Don’t allow spray drift to flowering plants in the vicinity of the treatment area. Before spraying, notify beekeepers to move hives to a safe location with an untreated source of nectar and pollen, if there is potential for managed hives to be affected by the spray or spray drift. Risk to bees is reduced by spraying in early morning and late evening while bees are not foraging. Residues may remain toxic to bees for several days after application.

Aquatic Life Safety

Abamectin is very toxic to aquatic life. Don’t contaminate wetlands or watercourses with this product.

Acaricide Mode of Action Classification:

A key to effective acaricide resistance management

Insecticide Resistance Action Committee

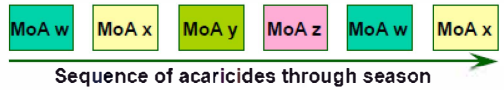
www.irac-online.org

Introduction

IRAC promotes the use of a Mode of Action (MoA) classification of insecticides and acaricides as the basis for effective and sustainable resistance management. Acaricides are allocated to specific groups based on their target site. Reviewed and re-issued periodically, the IRAC MoA classification list provides farmers, growers, advisors, extension staff, consultants and crop protection professionals with a guide to the selection of acaricides and insecticides in resistance management programs. Effective Resistance management of this type preserves the utility and diversity of available acaricides. A selection of relevant MoA groups is shown below.

Effective IRM strategies: Sequences or alternations of MoA

All effective pesticide resistance management strategies seek to minimise the selection of resistance to any one type of pesticide. In practice, alternations, sequences or rotations of compounds from different MoA groups provide sustainable and effective resistance management for acarine pests. This ensures that selection from compounds in the same MoA group is minimised, and resistance is less likely to evolve.



Applications are often arranged into MoA spray windows or blocks that are defined by the stage of crop development and the biology of the pest species of concern. Local expert advice should always be followed with regard to spray windows and timings. Several sprays may be possible within each spray window but it is generally essential to ensure that successive generations of the pest are not treated with compounds from the same MoA group. Metabolic resistance mechanisms may give cross-resistance between MoA groups, and where this is known to occur, the above advice must be modified accordingly. IRAC also provides general recommendations for resistance management tactics regarding specific MoA groups.

Nerve and Muscle Targets

Several current acaricides act on nerve and muscle targets. Acaricides that act on individual targets in this system are generally fast acting.

Group 1 Acetylcholinesterase (AChE) inhibitors
Inhibit AChE, causing hyperexcitation. AChE is the enzyme that terminates the action of the excitatory neurotransmitter acetylcholine at nerve synapses.
1A Carbamates (e.g. Methomyl), ***1B*** Organophosphates (e.g. Pirimiphos-methyl).

Group 2 GABA-gated chloride channel antagonists
Block the GABA-activated chloride channel, causing hyperexcitation and convulsions. GABA is the major inhibitory neurotransmitter in insects.
2A Cyclodiene Organochlorines (e.g. Endosulfan).

Group 3 Sodium channel modulators
Keep sodium channels open, causing hyperexcitation and, in some cases, nerve block. Sodium channels are involved in the propagation of action potentials along nerve axons.
3A Pyrethroids, Pyrethrins (e.g. Bifenthrin, Halfenprox).

Group 6 Glutamate-gated chloride channel (GluCl) allosteric modulators
Allosterically activate glutamate-gated chloride channels, causing paralysis. Glutamate is an important inhibitory neurotransmitter in insects.
Avermectins, Milbemycins (e.g. Abamectin, Milbemectin).

Group 19 Octopamine receptor agonists
Activate octopamine receptors, leading to hyperexcitation. Octopamine is the insect equivalent of adrenaline, the fight-or-flight neurohormone.
Formamidines (e.g. Amitraz)

Acaricides for which the mode of action is unknown

These compounds are not classified because there is not sufficient information available on their mode of action.

Benzoximate, Bromopropylate, Chinomethionat, Dicofol.

Respiration Targets

The mitochondrial respiration process produces ATP, which energizes all vital cellular processes. In mitochondria, an electron transport chain uses the energy released by oxidation to drive ATP synthesis. Several acaricides are known to interfere with mitochondrial respiration by the inhibition of electron transport and/or oxidative phosphorylation, and are generally fast to medium-fast acting.

Group 12 Inhibitors of mitochondrial ATP synthase
Inhibit the enzyme that synthesizes ATP.
12A Diafenthiuron, ***12B*** Organotin miticides (e.g. Azocyclotin, Fenbutatin oxide), ***12C*** Propargite.

Group 13 Uncouplers of oxidative phosphorylation via disruption of the proton gradient
Protonophores that short-circuit the mitochondrial proton gradient so that ATP can not be synthesized.
Pyrroles (Chlorfenapyr), Dinitrophenols (DNOC) and Sulfonamides (Sulfluramid).

Group 20 Mitochondrial complex III electron transport inhibitors
Inhibit electron transport complex III, preventing the utilization of energy by cells.
20B Acequinocyl, ***20C*** Fluacrypyrim, ***20D*** Bifenazate.

Group 21 Mitochondrial complex I electron transport inhibitors
Inhibit electron transport complex I, preventing the utilization of energy by cells.
21A METI acaricides (e.g. Fenazaquin, Pyridaben, Tebufenpyrad).

Group 25 Mitochondrial complex II electron transport inhibitors
Inhibit electron transport complex II, preventing the utilization of energy by cells.
25A beta-Ketonitriles (Cyenopyrafen, Cyflumetofen), ***25B*** Carboxanilides (Pyflubumide).

Growth and Development Targets

Insect and mite growth regulators act by mimicking growth hormones, by directly affecting cuticle formation, or lipid biosynthesis. Acaricdes that act on this system are usually slow acting. The target proteins are not always known.

Group 10 Mite growth inhibitors,
Incompletely defined mode of action leading to growth inhibition.
10A Clofentezine, Hexythiazox, ***10B*** Etoxazole.

Group 15 Inhibitors of chitin biosynthesis, type 0
Incompletely defined mode of action leading to inhibition of chitin biosynthesis.
Benzoylureas (e.g. Flucycloxuron, Flufenoxuron).

Group 23 Inhibitors of lipid synthesis
Inhibit acetyl coenzyme A carboxylase, part of the first step in lipid biosynthesis.
Tetronic & Tetramic acid derivatives (e.g. Spirodiclofen).

MAXIMISING PERFORMANCE WITH PROFORCE MALICE DUO ADVANCED MITICIDE

- To maximise performance Malice Duo Advanced Miticide should be applied with a non-ionic surfactant to ensure uptake.
- To be effective Malice Duo Advanced requires thorough spray coverage. Ensure that equipment is properly calibrated to give an even distribution at the correct volume. Application volume should be adequate to ensure thorough and even coverage of turf leaves with penetration into the crowns. Total application volume should be 400 to 800 L/ha. Use coarse droplets (Air Induction flat fan 025 to 04 nozzles). In higher cut turf (>15 mm) a significant spray shielding effect can occur, impacting negatively on spray penetration and even coverage at low application volumes.
- Do not spray while bees are actively foraging. Do not allow spray drift to flowering plants in the vicinity of the treatment area.
- Do not graze treated turf/lawn or feed turf/lawn clippings from any treated area to poultry or livestock.
- Malice Duo Advanced Miticide should not be applied if rainfall is imminent.

Malice Duo Advanced Miticide's Impact on the Couch Mite Lifecycle

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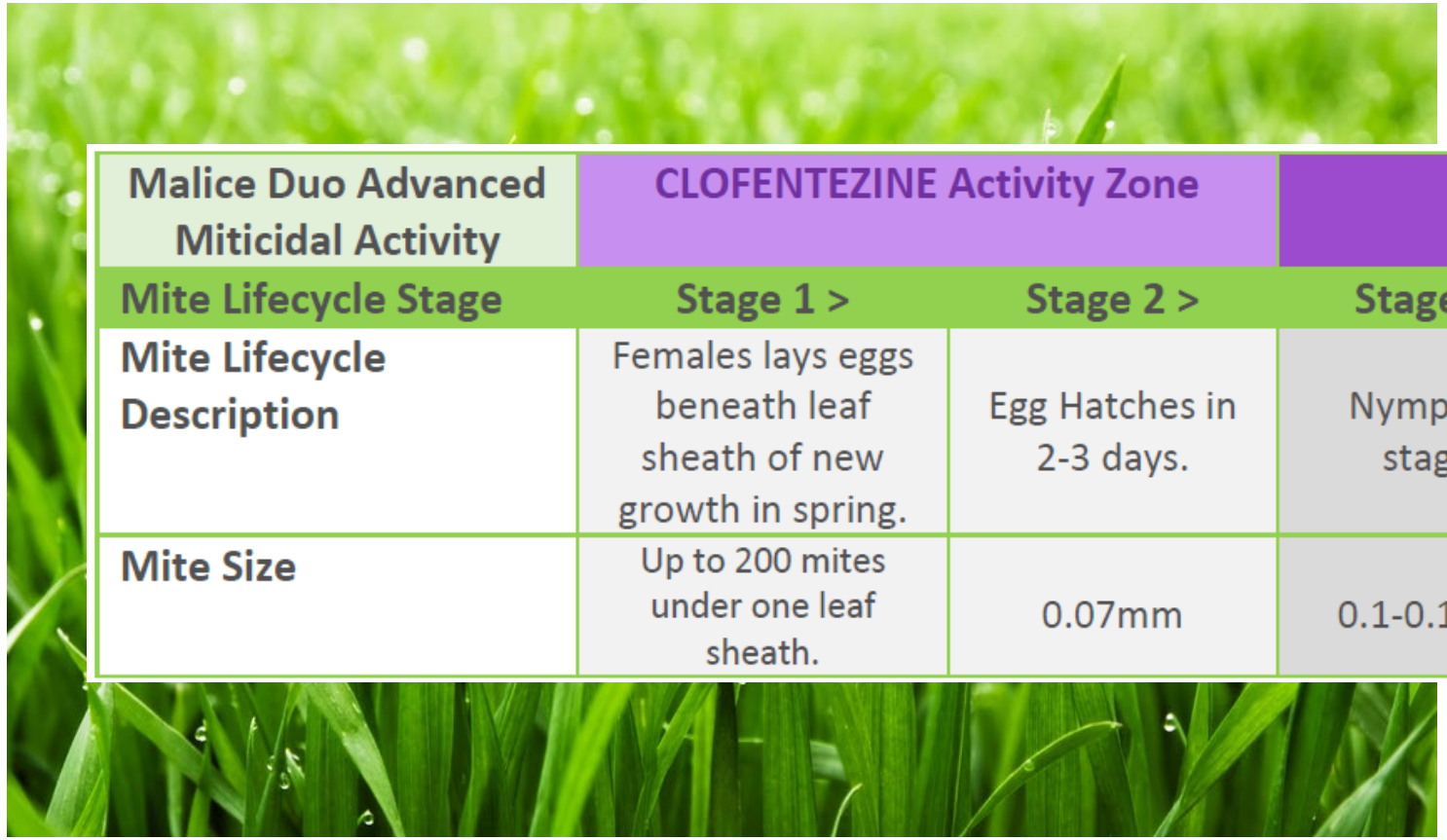

Malice Duo Advanced Miticidal Activity	CLOFENTEZINE Activity Zone		ABAMECTIN Activity Zone		
Mite Lifecycle Stage	**Stage 1 >**	**Stage 2 >**	**Stage 3 >**	**Stage 4 >**	**Stage 5**
Mite Lifecycle Description	Females lays eggs beneath leaf sheath of new growth in spring.	Egg Hatches in 2-3 days.	Nymph – 2 stages.	Molts to become adult after 6 days.	Breeds & females lay eggs for 2-4 days.
Mite Size	Up to 200 mites under one leaf sheath.	0.07mm	0.1-0.15mm	0.2mm	

Group	10A	6	Insecticide

Malice Duo Advanced Use Rates

Situation	Pest	Rate	Comments
Couch turf including but not limited to golf greens, tees and fairways, bowling clubs, sports fields and racetracks.	Couch Mite (*Aceria cynodoniensis*)	1.35 L/ha in 400-800 L of water per hectare.	Apply product in an early curative situation (after first symptoms are apparent). Best results are achieved if applied as populations begin to build rather than at the peak of population growth.

- **Retreatment intervals**
  - **High populations:** Re-treat at 14 day intervals
  - **Moderate populations:** 21 day intervals.
  - **Preventative:** 28 day intervals.

- **There are no limitations on number of treatments per season.** This is unlike Prophesy or Apollo which has a limitation of 2 applications per season.

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