Information Sheet

8.11 Insecticidal control of eldana

SASRI's Information Sheet 8.6 Integrated Pest Management (IPM) of eldana explains that IPM is a decision-making process that considers all pest management options to control potential pest outbreaks below a pre-determined injury level or action threshold while minimising risks to human health and the environment. However, it does not exclude the use of well-researched and known pesticides that fit into the sustainable use category. A decision to use an insecticide will be based on the presence of the pest at levels above an action threshold if no other intervention is possible.

Deciding whether to use an insecticide

Economic injury level (EIL) is defined as the lowest population density of a pest that will cause economic damage. For eldana, crop damage is used rather than population density, so, the EIL would be the level of crop damage at harvest, the value of which equates to the cost of a spray programme. Eldana crop damage is measured in **%Internodes Bored** (%IB), and the EIL for eldana in sugarcane is approximately 7% IB at harvest.

The **economic threshold** (ET) is that point at which control measures should be implemented to prevent the EIL being reached. In the early 2000s, it was found that a survey of eldana damage in August was a reasonable predictor of damage in cane carried over to the following April, and it was possible to calculate the action or economic thresholds for a spray programme given an EIL of approximately 7%IB at harvest. ET levels of 1%IB, 2%IB and 3%IB were estimated for susceptible, intermediate, and resistant varieties respectively, based on August damage estimates. The triggering of a spray programme at the end of August most often prevented the EIL being reached in the crop at harvest the following year.

These ETs still apply to the results of August surveys of 8- to 13-month-old cane in the Coastal region that will be harvested the next year. However, surveys should be carried out at other times, most importantly in February and at harvest. Decisions to spray based on e/100 stalks and %IB in February should take time to harvest into account, and other factors. Infestation level at harvest is related to below-ground and stubble infestation, which can be used to inform insecticide use in the following ratoon.

Contact SASRI specialists or Extension for advice on spraying, spray programmes, spray windows and timing.

Factors to consider when deciding whether to use an insecticide:

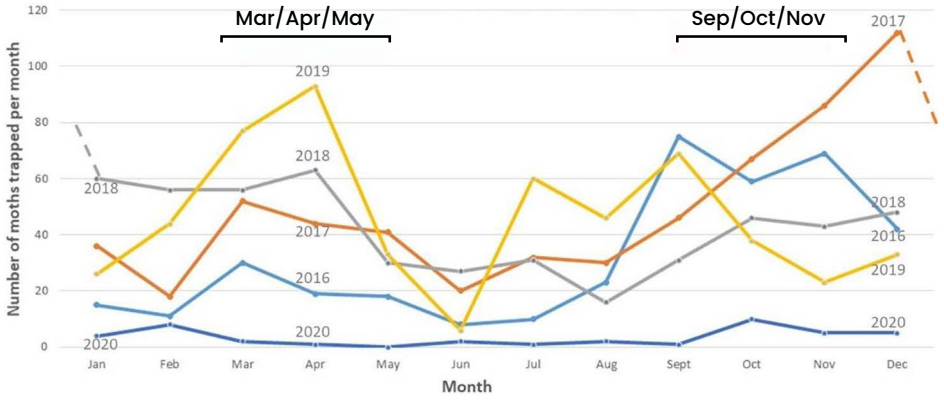
Varietal resistance. *Damage will accumulate more slowly in resistant varieties.*	Time to harvest. *Damage accumulates as eldana cycles through generations in the crop.*
Overall field history. *Sandy soils, shallow soils, sub-soil acidity and north-west facing slopes increase eldana risk.*	Medium term weather forecast. *Extended periods of below normal rainfall increase eldana risk.*
Infestation level at harvest in the previous ratoon or plant crop. *A proportion of the larval population survives in the stubble and below ground in the stool after burning and harvesting. Reinfestation is more likely if infestation at harvest was high.*	

Timing of spray applications

Insecticides have been used previously to prevent eldana infestation in carry-over crops. Typically, an insecticide was first applied near the end of August, targeting the September- October- November (SON) moth peak, when the crop was eight months or older.

A concern is that the use of insecticides in older cane is potentially damaging to the predator population which feeds on newly hatched larvae and can make an important contribution to natural control. However, in ratoons following burning, the predator population is low and builds up slowly to peak when the cane is six to ten months of age. Natural predation then becomes significant. It is therefore less damaging to predators, and a much easier operation, if insecticide is applied earlier in the crop cycle. Application in young cane, when new stalks are beginning to elongate, targets an initial invasion from outside the field, as well as moths arising from larvae feeding in stubble or in the stool below-ground.

A severe eldana impact on young cane is typically due to high numbers in the previous crop with below ground infestation of stools. This is common during droughts. Treating the crop during early stalk elongation, especially if this coincides with the March-April-May (MAM) moth peak or the SON moth peak in affected young cane will reduce subsequent eldana infestation levels.



▲ Moth abundance (peaks) over several years show variability which can be related to rainfall and cane age in the vicinity of the light trap. The March – April – May (MAM) moth peak appears more stable in time and can be more easily targeted with insecticides.

Female eldana moths lay their eggs on dry leaf material and the resultant larvae require stalk in which to bore. These conditions are first met during early stalk elongation in young cane. The following tables indicate the approximate timing of an insecticide application shortly after the beginning of stalk elongation for the coastal and midlands cycles. Sprays should be directionally targeted to the base of the newly forming stalks.

Timing of an insecticide application targeting early stalk elongation (adjusted considering moth peaks) for Coastal 18-month cycles.

Ratooning Month	Suggested timing of an early insecticide application based on ratooning in specific months
April	Late August to Early / Mid-September
May	Late September to Early / Mid-October
June	Late October to Early / Mid-November
July	Late November to Early / Mid-December
August	Early / Mid-December
September	Early / Mid-January
October	Mid-February
November	Late-February
Early/Mid December	Early / Mid-March

Further insecticide applications, if required, should be arranged into spray windows based on the modes of action (MoAs) of the different insecticides available.

Timing of an insecticide application targeting early stalk elongation (adjusted considering eldana moth peaks) for Midlands 24-month cycles.

Ratooning Month	Suggested timing of an early insecticide application based on ratooning in specific months
April	Late September to Early / Mid-October
May	Late October to Early / Mid-November
June	Late November to Early / Mid-December
July	Early / Mid / Late-January
August	Late February to Early / Mid-March
September	Early / Mid / Late March
October	Late March to Early / Mid-April
November	Late March to Early / Mid-April
Early/Mid December	Late April

Insecticide Resistance Management

To help prevent or delay the incidence of resistance, the Insecticide Resistance Action Committee (IRAC) promotes the use of a Mode of Action (MoA) classification of insecticides in effective and sustainable Insecticide Resistance Management strategies. Available insecticides are allocated to specific groups, based on target site in the insects' physiology, as described below. By using sequences or alternations of insecticides from different MoA classes, resistance is less likely to occur.

Insecticide applications are arranged into MoA spray windows or blocks informed by the stage of crop development and the biology of the insect pest. It is most important that consecutive generations of the pest are not sprayed with the same MoA.

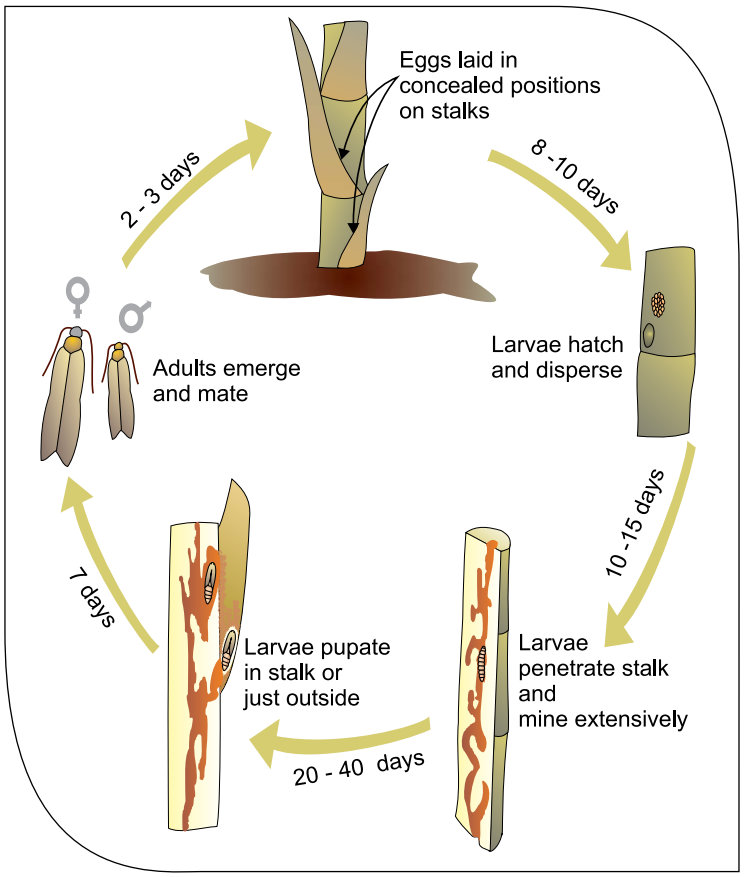
Insecticide MoAs currently registered for eldana control:

IRAC Class and Mode of Action	Chemical Class	Registered active ingredients	Registered products
Group 3 Sodium channel modulators Causes hyper-excitation and, in some cases, nerve block.	3A, Pyrethroids	a-Cypermethrin l-Cyhalothrin	Fastac Ampligo*
Group 6 Glutamate-gated chloride channel (GluCl) allosteric modulators Causes paralysis	Avermectins	Emamectin benzoate	Emma
Group 22 Voltage-dependent sodium channel blockers Causes nervous system shutdown and paralysis.	22A, Oxadiazine	Indoxacarb	Steward DoxStar-Flo Addition
Group 28 Ryanodine receptor modulators Causes muscle contraction and paralysis.	Diamides	Chlorantraniliprole Cyantraniliprole	Coragen Ampligo* Benevia*

*NB: Benevia and Ampligo are also registered for YSA control

Lifecycle considerations

To avoid using insecticides of the same MoA on consecutive generations of eldana, it is necessary to consider the insects' lifecycle and the residual period of each insecticide. Eldana's generation typically lasts between 47 and 75 days, depending on the temperature. This means that the average generation lasts about 61 days or two months, which is considered a spray window.



Lifecycle of eldana

In their early stages, eldana larvae scavenge on the outside of stalks for 10 to 15 days until they are robust enough to bore in. Once inside, larvae cannot be controlled by insecticides. Life stages that can be targeted by insecticides include moths through to the second instar larvae that bore into the stalk. There are about 20 to 28 days from a particular moth emergence to larval penetration into the stalk. To control eldana effectively, it is best to target periods of high moth abundance.

The following are examples of spray programmes. It should be noted that the label for the registered pyrethroid, a-cypermethrin, allows for a maximum of eight consecutive applications at two weekly intervals giving four months of control. This constitutes application of the same MoA to two consecutive 60-day spray windows which, while legal, is not ideal according to IRAC guidelines. It is therefore recommended that a-cypermethrin be applied to one spray window in alternation with different MoAs.

An example of an insecticide programme for Coastal 18-month crops (Other spray programmes are possible). ▼

X PERIODS OF INCREASED MOTH ABUNDANCE

			X	X	X				X	X	X				X	X	X				X	X	X				X	X	X	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18											
Green		P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18										
Manure			P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18									
				R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18								
					R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18							
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registered products	group	application
CORAGEN or BENEVIA	diamides (28)	one application - covers 2 months
STEWARD; DOXSTARFLO; ADDITION	oxadiazine (22)	two applications - one month apart
AMPLIGO	diamide + pyrethroid (28 + 3)	two applications - one month apart
FASTAC	pyrethroid (3)	maximum of 8 applications - two weeks apart
EMMA	avermectin (6)	one application to infested stubble

Examples of IRAC compliant eldana insecticide programmes for Midlands 24-month crops. (Other spray programmes are possible). ▼

X PERIODS OF INCREASED MOTH ABUNDANCE

			X	X	X				X	X	X				X	X	X				X	X	X				X	X	X				X	X	X	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Green	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23												
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			R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25								
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EMMA	avermectin (6)	one application to infested stubble

Recommendations for insecticide resistance management

- The same MoA should not be applied to consecutive spray windows, i.e. there should be at least 60 days between the end of a residual period and a second application containing the same MoA.
- MoAs should be alternated between windows wherever possible.
- No more than two windows should be sprayed with the same MoA within a crop cycle.
- If adjacent fields are sprayed at the same time, different MoAs should be used.
- In the next ratoon, a MoA different from the last application in the previous crop should be used.

Expert advice provided by SASRI specialists or Extension should always be followed regarding the need for spraying, spray programmes, spray windows and timing.

Stuart Rutherford (Principal Scientist: Integrated Pest Management)

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