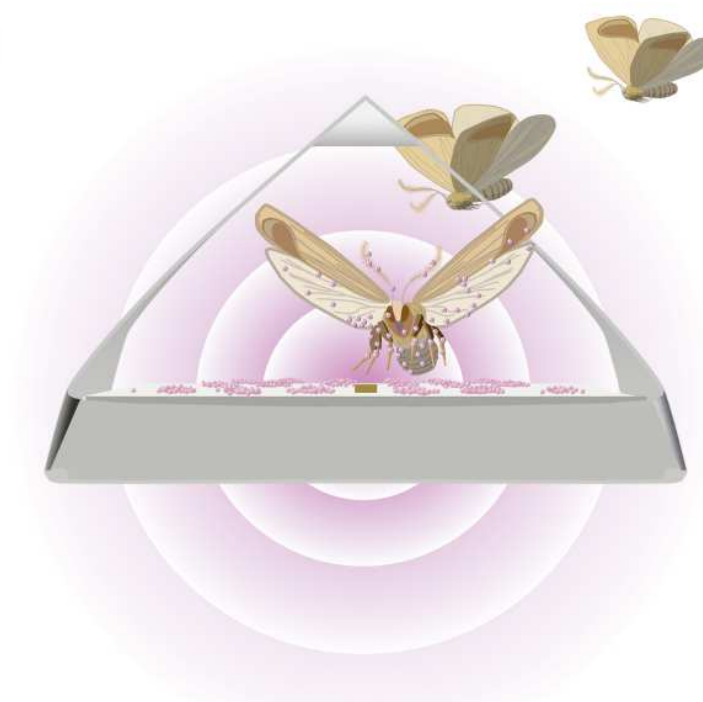


exosexTM CM

Auto Confusion DisruptionTM System Codling Moth



Technical Guide for apple & pear growers

Approved as an allowed organic input by 'IFOAM' affiliated members.

Note to growers

If you are reading this manual, you are either an organic grower or a conventional grower looking for ways to reduce your pesticide use and/or ways of integrating your pest management. Exosex is an entirely new and technologically advanced mating disruption system. It has been designed to vastly reduce the number of pheromone dispensers per hectare thus significantly reducing the man-hours required to deploy the system. The Exosex CM is the first product in this range and has been developed for Codling Moth.

Contents

1. What is Mating Disruption
2. Exosex CM description and mode of action
3. Optimising Exosex CM performance
4. Additional chemical treatments
5. Understanding Monitoring thresholds
(How to use and interpret data from the **exomonitor CM system**)

1. What is Mating Disruption?

In order to mate, female moths emit a plume of sexual pheromone, which creates a trail behind them. Male moths detect the pheromone via extremely sensitive sensors on their antennae. By tracing the plume they can locate the female and mate successfully.

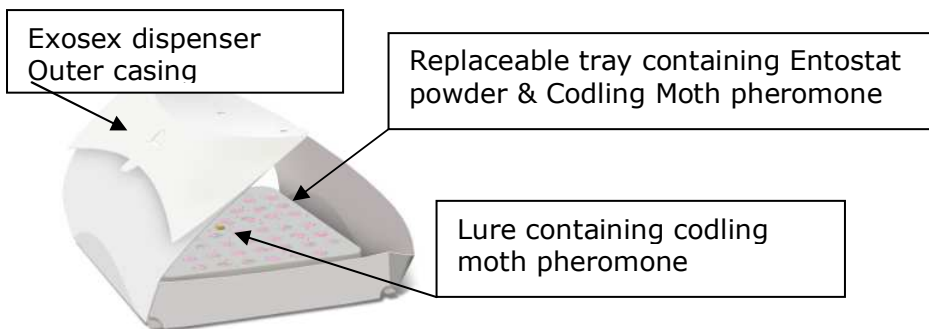


Traditional Mating Disruption techniques employ devices such as twist-ties or plastic flakes, which are impregnated with pheromone. When placed in large numbers (typically 500 to 1000 per hectare) within an area of infested crop, these products release the pheromone continuously at high levels, which creates a fog of female pheromone. As a result, male moths can no longer detect the individual plumes of sexual pheromone and the mating cycle is disrupted. The tags have to be placed in very high numbers to ensure that the level of pheromone is maintained in the atmosphere.

Exosect's Advanced Auto Confusion technology has been designed to reduce the number of pheromone dispensers required. The system requires only 25 dispensers per hectare. Therefore the time needed to place the system in the field is dramatically reduced and the option of mating disruption becomes much more practical and realistic for both conventional and organic growers.

2. Exosex CM description and mode of action

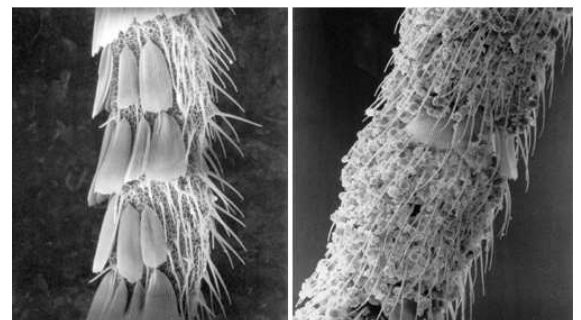
What does Exosex CM consist of?



The Exosex CM contains a pheromone lure in the center and also contains Entostat™ a natural wax powder that charges electrostatically through very slight movement. The slightest breeze through a dispenser will re-charge the powder.

As insects develop a charge over their bodies through movement, the powder adheres to them very strongly. The photo to the right shows moth antennae before coming into contact with Entostat powder and then after coming into contact with Entostat powder.

In Exosex CM, Entostat powder is combined with the female codling moth sex pheromone. The powder & pheromone adhere to the male moth and cause confusion.



Exosex CM is intended for use in apple and pear orchards.

How does Exosex CM work?

1



1. The dispenser containing Entostat™ and pheromone, is placed into the crop. The male Codling moth is attracted to the Exosex dispenser by the pheromone lure.

(Please note, Entostat powder is white, it has been shown as pink for illustration purposes only)

2



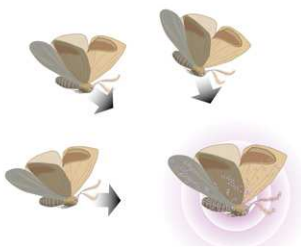
2. Due to the electrostatic quality of Entostat powder, simply walking across the powder-coated surface provides enough contact for it to adhere to the male moths. It sticks to all parts of its body, but most importantly its antennae become coated in the powder. The receptors on its antennae become overwhelmed with female pheromone.

3



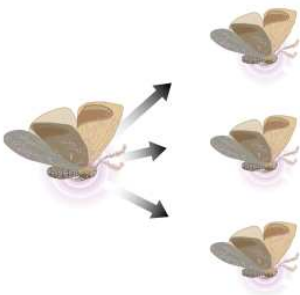
3. The male moth can no longer detect calling females as it is effectively blind to the individual plumes of pheromone.

4



4. A male carrying Entostat powder will form a mobile pheromone dispenser, producing "false" pheromone trails. Male moths become attractive to other males.

5



5. Attracted by the "false" pheromone trails, powder transfer will occur from males that have passed through the dispenser to other moths.

6



6. If a female is delayed in mating by more than 24 hours, her fertility is reduced, if she does eventually mate with an untreated male, the viability of her eggs will have been reduced.

3. Optimising Exosex CM performance

Packaging

The Exosex CM system is supplied in boxes of 2-hectare treatments. Each box contains 5 sachets of 10 Exosex CM trays, which should be used with the outer dispensers and 2 monitoring traps (supplied). The trays are supplied with the pheromone powder and lure placed inside with a transparent lid on the top. Only remove the lid once you have placed the outer dispenser in the orchard and read the assembly instructions carefully.

Apply at the right time

The Exosex CM dispensers must be in place in the orchard **before** Codling moth flight occurs (Biofix). It is better to place the dispensers 2 weeks too early than 1 day too late. Local Extension Services may be able to provide information on the expected date of Biofix. Computer programs are used to calculate this date using temperature data.

Replacement of the trays and lures

The pheromone in the lure and powder has a 70-day life. Therefore, the trays must be replaced within or at 70 days. Replacement trays are available again in 2 hectare boxes. It is very important that the trays are all replaced at the same time and also that the lure and glue board are replaced in the monitoring traps at the same time to ensure that the level of pheromone emitted from each dispenser and monitoring trap is consistent.

Place high in the tree:

Codling moth activity and mating are concentrated in the top third of the tree. Pheromone is heavier than air and will thus sink towards the ground, therefore the dispensers should be placed in the middle of the top third of the tree, at or above the level of any fruit and not at the outer edge of the canopy. Apply the dispensers to horizontal branches coming off the major limbs or to training wires.

Apply uniformly:

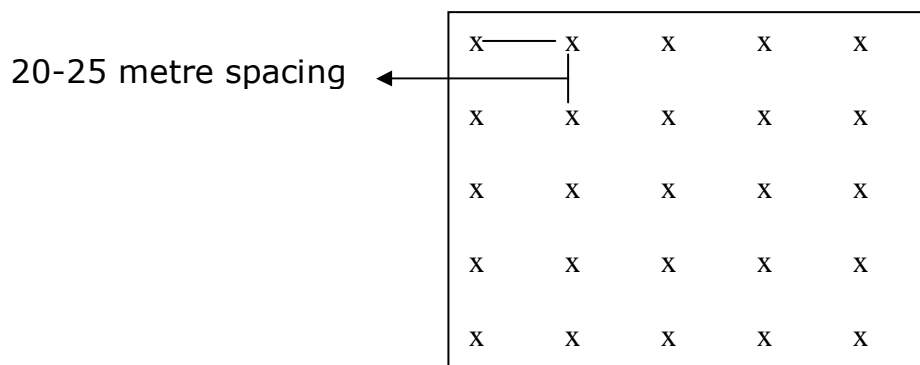
For optimal performance, there should be few holes in the pheromone "cloud" in the orchard. Therefore the dispensers must be placed uniformly throughout the treated orchard (see suggested placement grid overleaf). If a few trees are missing or if areas with small young trees are present, place extra dispensers in the surrounding high trees.

Orchard size:

Pheromones are most effective when used in orchards of 3 hectares and above. If the orchard is between 3 and 5 hectares, guard barriers must be put in place. This would mean, for example, adding a second row of dispensers on the external perimeter.

Dispenser Placement (standard grid pattern)

25 dispensers per hectare should be used. These should be as evenly spaced as possible throughout the crop. See the example below.



It is advisable to commence deployment in the area of the orchard with suspected highest pest pressure. Then work from this area in a grid pattern as above.

Dispenser re-arrangement

It is important to note that certain geographical aspects will affect the distribution of Codling moth; hence the density of codling moth throughout your crop may vary. The following points should be taken into consideration and may require you to move some dispensers from areas of low activity to areas of high activity.

Adjacent untreated orchards

If your orchard borders another orchard, even up to 300 feet away, where Codling moth is not controlled, the side that is closest to that orchard is likely to suffer from a higher infestation level.

Elevated land

Codling Moth tend to orientate to higher ground, therefore if your orchard is located on sloping land there is likely to be a gradient of infestation level from the low ground to the high ground.

4. Additional chemical treatments

If an orchard has 2-4% fruit damage due to Codling moth and no control measures are taken, the next season the fruit damage will probably increase to 20-30%. To keep Codling moth pressures similar from year to year, each generation should be suppressed by 95% or more.

If the Codling moth pressure is moderate to high, then a pheromone treatment alone will not provide sufficient protection and additional chemical treatment is recommended (you should consult your local extension services for confirmation of products recommended and approved for use in orchards – ***If the Codling moth damage in the previous year was more than 2%, a chemical treatment at first emergence of the pest is recommended.*** Supplemental insecticide applications during the season may be necessary in moderate to high populations to provide sufficient protection. The selection of the spray treatment should follow local experience and take into account if the orchard is a regular orchard, an IPM orchard or an organic orchard and should be based upon trap monitoring (see instructions below), or field scouting and must be timed to control emerging larvae.

5. Understanding monitoring thresholds

It is very important to monitor the level of moth infestation throughout the season using pheromone monitoring traps. This will provide you with valuable information on how the pest population is emerging, the level of infestation and hence if and when you may need to use supplemental spray treatments or re-arrange the dispensers. In order to get most out of using the monitoring traps, it is important that the data they provide is well understood. You may be used to interpreting the threshold levels when using monitoring traps in conjunction with a standard spray programme however the traps will catch male moths at a different frequency when used in conjunction with a traditional mating disruption systems and differently again when used with the Exosex CM advanced auto confusion system.

How to use and interpret data from the Exomonitor CM

Due to the unique method of the Exosex CM system, Exosect have developed a monitoring system that is fully compatible. Importantly, the pheromone lure used in the monitoring trap is exactly the same as the lure used in the Exosex system. The lure has been specially developed to release the pheromone at a more consistent level throughout its lifetime thus providing a more consistent picture of the moth levels. Using the same lure in the monitoring system ensures that the monitoring trap will not compete with the Exosex system or perform less consistently than the Exosex CM system.

Exosect recommend the use of one monitoring trap per hectare. The monitoring trap should also be hung in the top third of a healthy tree. Trees which are of a smaller size than the majority of those in the orchard should be avoided as should placing them too close to Exosex dispensers or on the boundary of the orchard.

They can be placed in 'hot-spots', but if so deployed should be supplemented with traps in more representative areas. The Exomonitor CM traps should be placed in the orchard prior to expected first moth flights – known as 'biofix'.

Inspection

The Exomonitor CM traps should be inspected at least once a week and numbers of *Cydia pomonella* recorded. These should be scraped from the glue-board with the spatula (provided) allowing further moths to be trapped in subsequent nights. The purpose of the Exomonitor CM traps, when used with the Exosex CM advanced auto confusion system, is to show the level of moth activity in the orchard at a given time, unlike when used with conventional mating disruption systems where zero counts, indicating trap shutdown, are sought.

Thresholds

Thresholds for introduction of supplementary control measures when used with the Exosex CM advanced mating disruption system:

The interpretation of trap catches depends on the level of damage acceptable in a particular orchard. For orchards where tolerable damage is below 1% - an average of 5 moths per week per trap or above in the traps would indicate that additional control measures for Codling moth should be employed.

For orchards where tolerable damage is below 2.5% - an average of 7 moths per week per trap or above in the traps would indicate that additional control measures for Codling moth should be employed. Where individual traps reach these thresholds even though averages are below threshold a 'spot-spray' may be indicated in this area, especially if the trap were placed in an area known to be a 'hot-spot'.

Additional methods such as thorough orchard scouting for eggs laid and damage sustained should be employed and decisions to supplement the Exosex CM system with additional control methods for Codling moth taken on these indications. Any supplementary treatments for Codling Moth should be timed to be applied at egg-hatch or before the larvae penetrate the fruit.

Replacement of lure and glue-board

The Exomonitor CM lure is designed and manufactured to release the same amount of pheromone as the Exosex CM and to be effective for a period of 70 days. The lure and glue-board should be replaced after 70 days and at the same time as a tray change with the Exosex CM if done prior to 70 days.

Further Information

Please contact:

Tel: +27 (0)28 313 2054

Biogrow
Suite 116
Hermanus 7200
South Africa