ISOMATE® C/OFM

A new approach to the control of Codling moth (Cydia pomonella) and Oriental fruit moth (Grapholita or Cydia molesta)

Morphological and biological features of *Cydia pomonella*

Adult Grey forewings crisscrossed with fine alternating grey and white undulate bands. The tip of each forewing has a distinctive coppery-tinged, dark brown spot. The dusky reddish backwings also have a copper to gold sheen.

Egg Disk-shaped and opaque white when first laid, the eggs later develop a reddish embryonic ring. The black head-thorax of the larva becomes visible just before hatching.

Larva Newly hatched larvae are white with black heads. As they progress through five instars, their colour changes, turning to pale yellow and eventually becoming tinged with pink during the mature stage.

Pupa Yellow at pupation, the colour gradually changes to brown.

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ISOMATE® C/OFM – Technical notes

The codling moth or *Cydia pomonella* originated in Europe, spreading to Asia in ancient times. By 1700 they had been brought to America by colonists.

Distribution of codling moths depends on the accumulation of at least 600 degree-days during the vegetative period of the host plant.
Low winter temperatures do not prevent diapausing larvae from overwintering, while the southern distribution limit is determined by the moths' need to spend part of the diapause period at very low temperatures.

The Codling moth is a typically carpophagous species which feeds almost exclusively on pome fruits and occasionally on walnuts (*Juglans regia*).

- Codling moth has from one to three generations each year depending on nutritional, genetic and climatic factors.

The overwintering larvae - distinguishable by their white colour - can be found mainly in cracks and crevices and under flaking tree bark.
The first pupae usually appear in Italy by the end of March. The moths usually emerge during the daytime and start to appear earlier in southern areas of Europe than in the north. Indeed, moths may be captured as early as the beginning of April in Emilia-Romagna (Italy).
There's no proper synchronism between moth emergence and plant phenology, as the first moths of the season may appear even before blossoming.

- Female moths release pheromones which attract the males of the species

Virgin female moths fly to the tops of apple trees to call for their mates at dusk. They release plumes of pheromone, a semio-chemical element which stimulates intra-specific interactions. Male moths locate females by flying upwind, criss-crossing over the trails of pheromone produced by the female moths.

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Most females mate within an hour of the onset of calling (emission of pheromone into the air). Then they begin to lay eggs.
Eggs are usually laid singly on or close to fruit, mainly on smooth areas like the upper surface of leaves. Eggs laid in early spring may take 20 days or more to hatch depending on the mean temperature of the period, while those laid in summer take only 7 or 8 days.
The newly hatched larvae tend to disperse randomly as they immediately begin crawling to seek fruit upon which to feed. They generally wander (for several metres) for a period of 1-2 days. Larvae usually penetrate fruit skins in protected areas (calyx end, stem end or points of contact between fruits).

After entering the fruit, the larvae start to feed beneath the surface. Following a spiral pattern, they pass through the first moult and then tunnel to the centre of the fruit, where they feed on the seeds.
The feeding behaviour and habits of newly hatched larvae are largely determined by temperature. In very high temperatures, the larvae enter the fruit through the calyx end and bore rapidly to the core. As larval development nears completion, the larvae eat their way out of the fruit.Mature larvae leave the fruit and construct silken cocoons in protected areas where they pupate and become adults.

Morphological and biological features of *Cydia molesta*

Adult small moths with brown forewings.

Egg similar to Codling moth eggs (also during embryonic evelopment), but slightly smaller.

Mature larva pink-yellow or reddish coloured.

Pupa brownish or reddish, approximately 6 - 7 mm long

The Oriental fruit moth probably originated in the north of China. It's first appearance in Europe – in Liguria (Italy) – was recorded in 1920. The moth has since spread to other adjacent countries.

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Today, the Oriental fruit moth mainly infests rose species and stone fruits (especially peaches, apricots and plum-trees). However, in recent years it has also become a serious problem for pome fruits, especially when these are planted near stone fruit orchards.

- Oriental fruit moth larvae are shoots, twigs and fruits borers

The moths over winter as full-grown larvae in cocoons in tree bark crevices, on the ground or in fruit containers.
The first adults begin to emerge in the middle of march, although emergence varies according to the mean temperature of the period.

The adult moths generally fly at dusk (at a temperature of at least +16 °C). Moth emergence is followed by mating and egg laying.
Each female moth lays approximately 50 eggs. The eggs are usually laid on the undersides of leaves but may also be deposited on shoots and sprouts, or even directly on non-tomentose young fruits. The incubation period varies from two weeks to a minimum of 5-6 days during summer.

After wandering over twigs and leaves in search of food for a certain period of time, the newly hatched larvae enter tender new twigs at the shoot axil and then gradually work their way down the shoots.

Before reaching maturity, the larvae damage many different twigs leaving them as they harden for others. Then they seek a protected place on the trunk or on the ground around the base of the tree in which to spin a cocoon.

Later generation OFM larvae also feed on twigs and then enter the fruit as the twigs harden or attack the fruit directly particularly late in the season.

The larvae usually enter the fruit at the side or via the stem.
Once a larva has entered a fruit, it either bores a long irregular channel through the soft tissue down to the seeds or confines its activity to a small area of the tissue.
More than one larva may feed on the same fruit.

- Functioning of Isomate® C OFM dispensers with regard to the codling moth and oriental fruit moth

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ISOMATE® C/OFM – Technical notes

Isomate® C OFM is a controlled release dispenser containing a synthetic pheromone which is chemically identical to the natural pheromone of the female codling moth and oriental fruit moth.

If the absolute number of female moths in the orchard is low, the false scent trails produced by the synthetic pheromone released into the air simply distract the male moths and prevent them from locating the females. Thus no mating occurs and the number of fertile eggs laid and the consequent number of larvae which hatch are dramatically reduced.

If the number of female moths is higher, some males may find females, but mating is delayed.
Thus fewer fertile eggs are laid and the chances of successful control of the pest are improved.

If the number of moths in the orchard is enormous, sufficient chance meetings between males and females occur to allow a significant level of infestation.

It is therefore vital to assess the moth population density within the orchard in which the mating disruption technique will be implemented prior to selecting the appropriate control strategy.

PRODUCT SPECIFICATIONS

Isomate® C/OFM

Isomate® C/OFM twist-tie dispensers are supplied in vacuum packs of 400 units. Each brown-red polymer dispenser consists of two parallel tubes. The wire-filled tube is designed to ensure rigidity, while the other sealed tube is filled with pheromone. The dispensers are designed to be twisted around the branches of the trees.

In case of left-over stocks, unopened packages can easily be stored in cold storage facilities at temperatures below 10 °C (50 °F).

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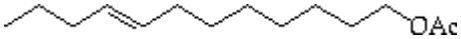
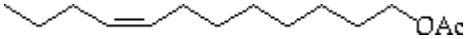
After cold storage, dispensers must be kept at room temperature for at least one month prior to field application.

Application rate

1000 dispensers per hectare (standard rate)*

* estimated rate which may vary according to orchard conditions

Chemical structure

 (E,E)-8,10-Dodecadien-1-ol	 Dodecan-1-ol
 Tetradecan-1-ol	 (E)-8-Dodecenyl acetate
 (Z)-8-Dodecenyl acetate	
 (Z)-8-Dodecen-1-ol	

Besides the Codling Moth pheromone, constituted by alcoles, is conteinaed a minor dosage mixture constituted by acetates and alcoles, which is the Oriental Fruit Moth pheromone.

Nominal field life

Release life is approximately 130/150 days for Codling Moth and 80/90 days for Oriental Fruit Moth (**ALWAYS** related with average wind velocity and average daily temperature of application area)
Early rather than late application is recommended.
Research data show that bringing the date of application of the dispenser forward by one month, only reduces the field life of the dispenser by a few days.

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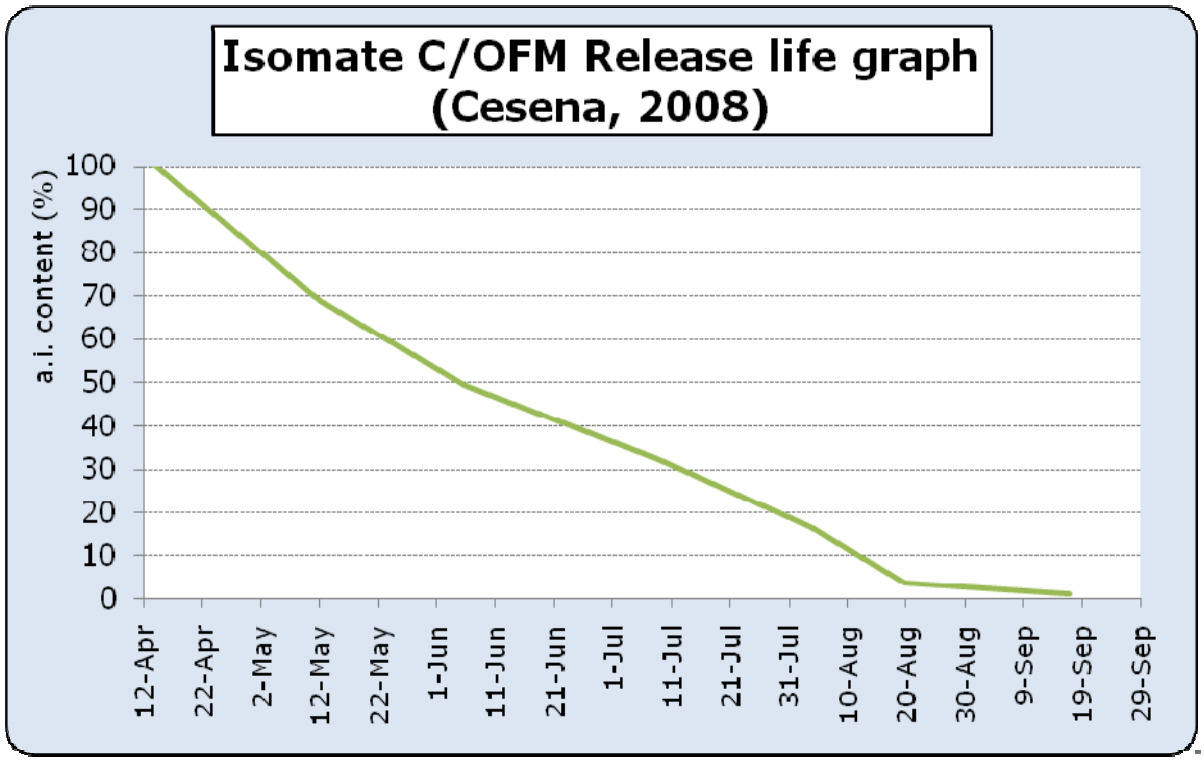

PLANNING AN ISOMATE® C/OFM IPM PROGRAMME

Aims

The aims of an IPM programme using mating disruption techniques are following:

- To prevent significant damage by Codling moth and Oriental fruit moth,
- To reduce the population of Codling moths an Oriental fruit moth or maintain very low levels;
- To build up beneficial insect and mite populations in the orchard.

In case of **low pests' population density** and if **no** migration of mated female moths from adjacent orchards occurs, the first of these aims can be easily fulfilled during the first year of implementation. The other aims can be fulfilled over a number of years (at least two) of uninterrupted application.

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Once sufficient beneficial insect populations have been established, the number of applications used against secondary pests such as mites or psylla may also be reduced.
Once the codling moth population has been reduced to a low level, mating disruption may be used alone to ensure pest management.

Special attention should be paid to irregular orchards in which there are numerous gaps, orchards located in windy areas and orchards surrounded by herbaceous crops which provide no protection from the wind.

Codling moth infestation assessment

Codling moth pressure in the orchard may be assessed by analysing:

1. Codling moth infestation at previous harvest

Codling moth infestation at previous harvest	Codling moth pressure
< 0.01	Very low
From 0.01 to 0.09	Low
From 0.1 to 0.4	Low to moderate
From 0.5 to 0.9	Moderate
From 1 to 4	High
From 5 to 10	Very high
> 10	Disastrous

2. Last season's monitoring trap catches (in conventionally managed orchards)

Pheromone trap counts in conventionally managed orchards (moths/trap/season)	Codling moth pressure
< 20	Very low
20-50	Low
50-100	Moderate
100-200	High
> 200	Very high

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Planning an appropriate pest management programme

Codling moth and Oriental fruit moth pressure	ISOMATE® C/OFM based IPM programme	When to use this strategy
Very low to low	ISOMATE® C/OFM (1000/ha) One application in early spring (before the first flight of overwintering moths)	This is the standard treatment for well managed orchards with low CM and OFM pressure. All pests should be constantly monitored in the orchard.
Moderate to high	ISOMATE® C/OFM (1000/ha) together with a light programme using conventional insecticides	This is the programme to use when CM and/or OFM populations in the first year or two are too high to be able to rely exclusively on ISOMATE® C/OFM
Very high	ISOMATE® C/OFM (1000/ha) together with a full programme using conventional insecticides	This programme has been successfully used to drastically reduce CM and OFM in orchards where populations and damage levels were high despite a heavy use of insecticides.

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Choosing the proper insecticide

The use of active ingredients with low impact on "beneficial insects" is recommended.
An example of the proper use and timing of application for some of these active ingredients is reported in the following table:

Cydia pomonella		
Following AI should be applied after the threshold of 1-2 adults/trap/week has been exceeded		
Ovicides		
IGR	**Characteristics**	**Notes**
Diflubenzuron	IGRs are chitin synthesis inhibitor that prevent the N-glucisamine production essential for the chitin development in the insects cuticle.	These ovicides inhibit the development of the embryo inside the egg both in the case of direct spraying on eggs and in the case of oviposition on treated foliar surfaces. Persistence: 15-20 days.
Flufenoxuron		
Larvicides		
VIRUS	**Characteristics**	**Notes**
Codling moth Granulosis Virus (CpGV)	This biological insecticide must be ingested in order to be effective, after which the viral occlusion bodies dissolve in the larval midgut and release infectious virions. These enter the cells lining the digestive tract, where they replicate; eventually, the other tissues are infected and the larva stops feeding and eventually (within 3–7 days) dies. After death, the larva disintegrates, releasing billions of new occlusion bodies, which may infect other codling moth larvae upon ingestion.	Granulosis-based products must be applied close to egg-hatching in such a way that the virus is swallowed by newly hatched larvae
MAC	**Characteristics**	**Notes**
Tebufenozide	Insecticidal ecdysteroid agonist that cause insect larvae to moult prematurely and die (Moulting Accelerating Compound).	This insect growth regulator has no ovicide efficacy. Therefore it must be applied at the end of embryonic development or on newly hatched larvae. Persistence: 21 days.
Methoxyfenozide		
SPYINOSIN	**Characteristics**	**Notes**
Spinosad	Spinosad acts on the post-synaptic nicotinic acetylcholine (Ach) and γ-aminobutyric acid (GABA) receptors, resulting in tremors, paralysis, and death of the target insects.	The product acts principally on larvae both by contact and ingestion. It is used at the end of embryonic development or on newly hatches larvae.
AVERMECTIN	**Characteristics**	**Notes**
Emamectina benzoato	The mode of action is similar to abamectin (GABA - and glutamate-gated chloride channel agonist), Emamectin benzoate acts by stimulating the release of r-aminobutyric acid, an inhibitory neurotransmitter, thus finally activating chloride channels. The target insect stop feeding within hours of ingestion, and die 2-4 day.	It possesses larvicidal activity by contact and ingestion. The optimal application timing ranges from pre-hatching egg to larvae late stage (L_4-L_5).

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NEONICOTINOIDS	Characteristics	Notes
Thiacloprid	It disrupts the nervous system by acting as an inhibitor at nicotinic acetylcholine receptors.	Efficacy on eggs and on larvae (L1 age).
RYANODIN	**Characteristics**	**Notes**
Rynaxypyr (chlorantraniliprole)	Rynaxypyr's mode of action is activation of insect "ryanodine receptors" (RyRs), which stimulates the release of calcium from internal stores of smooth and striated muscle, causing impaired muscle regulation, paralysis, and finally death.	Rynaxypyr possesses ovi-larvicidal activity. Ovicidal activity consist in either killing the embryo or the completely developed larvae inside the egg, such that the egg membrane remains intact and the individual does not hatch. Larval mortality is caused by exposure of the neonates to the residues deposited on the outer egg surface, from ingestion of the treated egg membrane or corion, during egg hatch.
NEMATODS	**Characteristics**	**Notes**
Entomophatogenic Nemtodes (*Steinernema feltiae, S. carpocapsae*)	Entomopathogenic nematodes naturally occur in the environment as parasites of many insect larvae. These small organisms (0,4-1 mm) actively seek out their insect hosts. When a host has been located, the nematodes penetrate into the insect through body openings and release symbiotic bacteria that multiply and rapidly kills the insect in 24-72 hours.	The nematodes must be mixed with water and applied with a sprayer to the tree trunk, main branches and the soil beneath the tree preferably in correspondence of rainy weather or abundant irrigations.
NON-ESTHER PYRETHROID	**Characteristics**	**Notes**
Etofenprox	Etofenprox acts on the nervous system of insects disturbing the function of neurons by interaction with the sodium channel.	It has insecticide activity by contact and ingestion, has a broad spectrum of action on a wide variety of pests, with fast knockdown
ORGANOPHOSPHATES	**Characteristics**	**Notes**
Chlorpyrifos etile	Organophosphates interfere with acetylcholine-mediated synaptic transmission in the nervous systems inhibiting the enzyme acetylcholinesterase (AChE) resulting in acute cholinergic over-stimulation at nicotinic and muscarinic synapses of the peripheral, autonomic and central nervous systems.	Organophosphates must be applied at the end of embryonic development or on newly hatched larvae. Some of these products are able to destroy larvae even in the first subepidermal strata of the fruit

Cydia molesta

Following AIs should be applied after the thresholds of 30 adults/trap/week (first generation) and of 10 adults/trap/week (later generations) have been exceeded

Larvicides

BACTERIA	Characteristics	Notes
Bacillus thuringiensis	Microbial insecticide acting by ingestion. When a susceptible insect ingests Bt, the protein toxin is activated by alkaline conditions and enzyme activity in the insect's gut. The toxicity of the activated toxin is dependent on the presence of specific receptor sites on the insect's gut wall. If the activated toxin attaches to receptor sites, it paralyzes and destroys the cells of the insect's gut wall, allowing the gut contents to enter the insect's body cavity and bloodstream.	*Bacillus*-based products must be applied close to egg-hatching in such a way that the crystal proteins are swallowed by the newly hatched larvae. Persistence: 7-10 days.
MAC	**Characteristics**	**Notes**
Metoxyfenozide	Insecticidal ecdysteroid agonist that causes insect larvae to moult prematurely and die (Moulting Accelerating Compound).	This insect growth regulator has no ovicide efficacy. Therefore it must be applied at the end of embryonic development or on newly hatched larvae. Persistence: 21 days.

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NEONICOTINOIDS	Characteristics	Notes
Thiacloprid	It disrupts the nervous system by acting as an inhibitor at nicotinic acetylcholine receptors.	Efficacy on eggs and on larvae (L1 age).
OXADIAZINE	**Characteristics**	**Notes**
Indoxacarb	Indoxacarb possesses ovi-larvicidal activity. Larval mortality is caused by exposure of the neonates to the residues deposited on the outer egg surface, from ingestion of the treated egg membrane or corion, during egg hatch.	Low ovicide efficacy. Therefore it must be applied at the end of embryonic development or on newly hatched larvae. The best application timing is beginning of oviposition and black head stage.
NON-ESTHER PYRETHROID	**Characteristics**	**Notes**
Etofenprox	Etofenprox acts on the nervous system of insects disturbing the function of neurons by interaction with the sodium channel.	It has insecticide activity by contact and ingestion, has a broad spectrum of action on a wide variety of pests, with fast knockdown
SPYNOSIN	**Characteristics**	**Notes**
Spinosad	Spinosad acts on the post-synaptic nicotinic acetylcholine (Ach) and γ-aminobutyric acid (GABA) receptors, resulting in tremors, paralysis, and death of the target insects.	The product acts principally on larvae both by contact and ingestion. It is used at the end of embryonic development or on newly hatches larvae.
AVERMECTINE	**Characteristics**	**Notes**
Emamectin benzoate	The mode of action is similar to abamectin (GABA - and glutamate-gated chloride channel agonist), Emamectin benzoate acts by stimulating the release of r-aminobutyric acid, an inhibitory neurotransmitter, thus finally activating chloride channels. The target insect stop feeding within hours of ingestion, and die 2-4 day.	It possesses larvicidal activity by contact and ingestion. The optimal application timing ranges from pre-hatching egg to larvae late stage (L_4-L_5).
RYANODIN	**Characteristics**	**Notes**
Rynaxypyr (**Chlorantraniliprole**)	Rynaxypyr's mode of action is activation of insect "ryanodine receptors" (RyRs), which stimulates the release of calcium from internal stores of smooth and striated muscle, causing impaired muscle regulation, paralysis, and finally death.	Rynaxypyr possesses ovi-larvicidal activity. Ovicidal activity consist in either killing the embryo or the completely developed larvae inside the egg, such that the egg membrane remains intact and the individual does not hatch. Larval mortality is caused by exposure of the neonates to the residues deposited on the outer egg surface, from ingestion of the treated egg membrane or corion, during egg hatch.
PYRETHROIDS	**Characteristics**	**Notes**
Acrinathrin	Acrinathrin affects both the peripheral and central nervous system of the insect. It works by keeping open the sodium channels in neuronal membranes. It disrupts the normal functioning of nerve sodium channels, leading to hyperactivity, paralysis and death. Acrinathrin provides excellent knock-down efficacy and good residual activity (2-3 weeks).	It acts by contact and stomach action. It shows strong activity on adults and newborn larvae.
ORGANOPHOSPHATES	**Characteristics**	**Notes**
Clorpirifos etile	Organophosphates interfere with acetylcholine-mediated synaptic transmission in the nervous systems inhibiting the enzyme acetylcholinesterase (AChE) resulting in acute cholinergic over-stimulation at nicotinic and muscarinic synapses of the peripheral, autonomic and central nervous systems.	Organophosphates must be applied at the end of embryonic development or on newly hatched larvae. Some of these products are able to destroy larvae even in the first subepidermal strata of the fruit
Clorpirifos metile		
Phosmet		

N.B.: In the application of various products, carefully follow the instructions and warnings on the label provided by the manufacturers.
Some a.i. may not be authorized in some IPM programs, therefore refer to local IPM Gudelines

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Side-effects of some pesticides on natural enemies

IOBCwprs Working Group "Pesticides and Beneficial Organisms & IOBCwprs Commission "IP Guidelines and Endorsement" (05.12.2005 Comm.)	**Type**	**Classification of side effects to beneficial organisms** **N** = harmless or slightly harmful (Reduction field, semi-field 0-50%, lab 0-30%) **M** = moderately harmful (Reduction field, semi-field 50-75%, lab 30-79%) **T** = harmful (Reduction field, semi-field > 75%, lab >80%) **Normal black entries** = laboratory data (IOBC) **Bold black face** = semi-field test data (IOBC) **Asterix * marked black entries** = Field test data (IOBC)															
Active ingredients	I = Insecticide A = Acaricide	Predatory mites (*Typhlodromus pyri*)	Predatory mites (*Phytoseiulus persimilis*)	Spiders (*Pardosa spp.*)	Spiders (*Cheiracanthium mildei*)	Flower bugs (*Anthocoris nemoralis*)	Flower bugs (*Orius laevigatus*)	Lacewings (*Chrysoperla carnea*)	Lady bird beetles (*Coccinella 7-punctata*)	Rove beetles (*Aleochara bilineata*)	Ground beetles (*Poecilus cupreus*)	Parasitoids (*Aphidius rhopalosiphi*)	Parasitoids (*Trichogramma cacoeciae*)	Hoverflies (*Syrphus corollae*)	Toxicity to bees	Toxicity to earthworms (*Eisenia foetida*)	Fish toxicity
Azadirachtine	I	N	T			T	N	M	N		**N**	**M**	T	M	-		
BT var. kurstaki	I	N*	**N**			M		**N**	**N**	**N**	N		N		-		-
Buprofezin	I	N	**N**		N	N		N	**N**	N			N		-		+
Chlorpyrifos-ethyl	I	T	**T**	T	T	M		**T**	**M**	**T**			T	T	+	+	+
Chlorpyrifos-methyl	I	M-T				M		**T**	**N**				T		+		+
Diflubenzuron (IGR)	I	N*	**N**		T	N	M	**T**	**N-M**	N			N		-	-	-
Fenoxycarb (IGR)	I	N*	**N**		N	N*	M	**M**	**N**	**N**		**M**	N		+		+
Flufenoxuron (IGR)	I	N*	N			M		M*		T	N						
Granulosis-Virus	I	Selective method of control without influence on beneficial arthropods															
Imidacloprid	I	N*	T			T	**T**	**M**	T		N	T	T		+	(-)	(-)
Indoxacarb	I	N				M		N	M	N			M	N	-	-	+
Lufenuron	I	N*	**N**			N	**M**	**T**	**T**			M	M		-		-
Methoxyfenozide (IGR)	I	N				N		**N**					N		-		-
Phosmet	I	T*	**T**					N*	**M**	**N**			T				
Pirimicarb	I	N				N		N	N				M	M	-	-	-
Rotenone	I	M				M		M					M		-		+
Spinosad	I	N*	N				N	N	N				M		+		-
Tebufenozide (IGR)	I	N*	N			N	**N**	**N**	**N**		N	N	N		-		
Teflubenzuron (IGR)	I	N				N		N	T				N	N	-		-
Thiacloprid	I	N		M					T	N	M	T			-		+
Triflumuron	I							T*							-		
Abamectine	A	N-T	**T**				**T**	**N**	**N**			T	T		+		+
Clofentezine	A	N*	**N**		N	N*		N	**N**	**N**			N	N	-		-
Etoxazolo	A	M						M					N		-		+
Hexithiazox	A	N*	**N**		N	N*		N	**N**	**N**			N		-		-
Fenazaquin	A	M				M									-		+
Fenpyroximate	A	N-M	T			N-M	**N**	N	T	N	N	T	M		-		+
Spirodiclofen	A	N-M				M		**N**	**M**				N	N	+		-
Tebufenpyrad	A	M*	T			T	**N**	N	**N**		N	T	T	M	-		+

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TIMING AND METHOD OF APPLICATION OF ISOMATE® C/OFM IN ORCHARDS

Timing of application

Isomate® C/OFM dispensers **must** be applied in spring before the first Codling moth flight (biofix or first catch in monitoring traps), in this case *Cydia molesta*, the pest which begin the first flight for first. Early application is to be preferred as the amount of pheromone released by dispensers is sufficient to remain effective for the entire season and it is very important to control the first moths emerging in the orchard.
Depending on the dispenser specifications, a delay in application does not necessarily defer termination of the release of the active ingredient.
Research data show that bringing the date of implementation of the dispenser forward by one month, only reduces the field life of the dispenser by a few days.

Location of dispensers

Dispensers should be placed within half a metre of tree tops.

Application rate

ISOMATE® C /OFM	1000 dispensers per hectare

Control of application programme

In order to establish the application scheme it is important:

1) To know the overall surface of the orchard in such a way as to be able to assess the total number of dispensers required. Once the number has been calculated, a further 5% should be added (according to the size of the orchard) for additional applications in border rows.

2) To know the total number of plants per hectare (calculated on the basis of plant spacing).

3) To apply dispensers uniformly throughout the entire orchard according to the recommended application rate.

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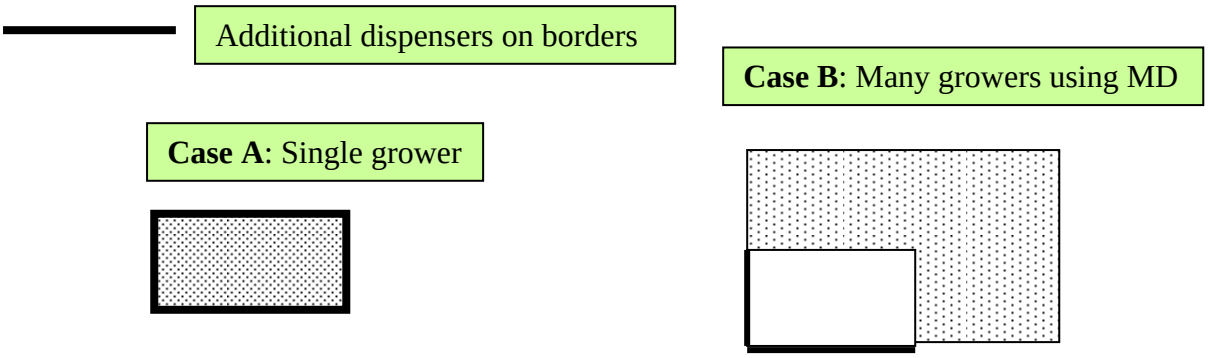
4) To apply one dispenser per each of the first three trees of the orchard and each of the trees in the first two border rows (in areas with prevailing winds from a particular direction, supplementary dispensers need only be placed on leeward borders).

5) To place dispensers according to the application diagram without reducing application rate. Any left-over dispensers should be used in hot spots of the orchard and windy areas (edges, high spots) in which pheromone concentration may be reduced. Download our dosage calculation software from www.cbceurope.it/biocontrol

6) To cooperate with neighbours for an area-wide approach

Oriental fruit moths do not respect fences and can move considerable distances (up to 2–3 km). Thus the migration of mated females from adjacent orchards can be a serious problem. The best way to beat this pest is to cooperate with neighbours in such a way as to manage OFM using mating disruption techniques throughout a wide area. This not only increases the chances of success of the method, it also reduces the total amount of materials needed.



Method of application

Isomate® C/OFM dispensers must be applied on lateral branches without twisting them too tightly.

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Avoid applying dispensers as shown in following pictures

IN-SEASON MONITORING OF ORCHARDS

If fruit damage at harvest in the previous season stood at 1% or more, the orchard in question should be carefully monitored during the early season.
Indeed, only by careful monitoring of the orchard during the season in progress is it possible to assess whether the mating disruption technique is functioning properly.
Border rows and potential hot spots - i.e. areas in which high codling moth infestation levels were recorded during previous years - should be scouted regularly.

At least 1,000 fruits per hectare should be checked for damage. Sample fruit should be chosen from the central area of the orchard and from the leeward borders. If fruit damage exceeds the established thresholds, supplemental treatments may be needed. Scouting should take place frequently, especially during the period of larval development of each codling moth generation.

Timing of intervention	Damaged fruits/1000
June	3
July	5
August	8

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Regarding Oriental fruit moth, 500 sprouts on 10 different trees (ca. 50 sprouts/tree) or 500 fruits should be checked for damage. Samples should be chosen from the central area of the orchard and from the borders.
If damage exceeds the established threshold of 5 % on sprouts or 0.5 % on fruits, supplemental treatments may be needed.

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