



**BIOLOGICAL
CONTROLS**

fargro



The leading supplier of (IPM) Integrated Pest Management

Fargro is the leading supplier of Integrated Pest Management (IPM) products across all horticultural sectors. We understand IPM and are always seeking to offer the best controls to suit grower requirements. For many years our experts have been leading the way in providing the most effective modern methods of protecting against pests in a sustainable way with minimal environmental impact.

We deliver pest and disease control through the application of biological controls, IPM compatible pesticides, and an ever-increasing range of biopesticides.

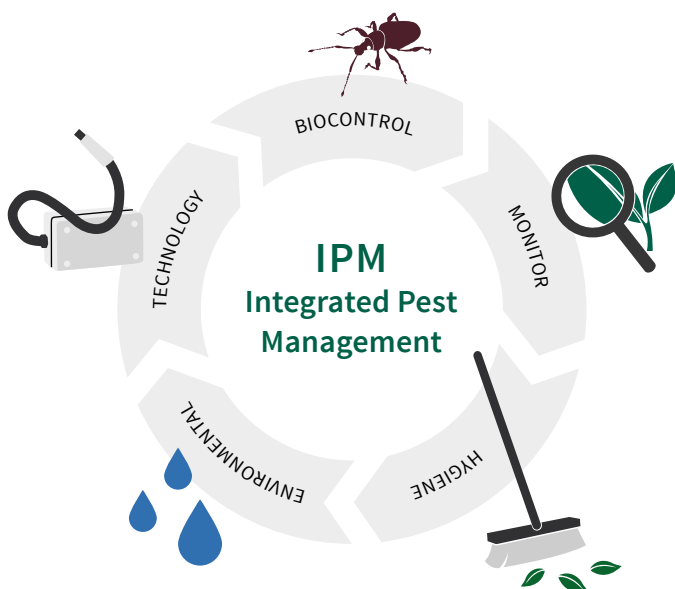
We pride ourselves in being able to offer:

- Tailored customer-specific IPM programmes
- Full product technical support and helpline
- Agronomy services

We are lucky enough to work with some of the country's leading growers and gardeners, from National Trust properties to zoos! Whether you produce fruit, herbs, vegetables, are an ornamental grower or a private estate, we want to hear from you.

If we can help design an IPM programme for you or you would like to order, get in touch on **01903 256 857** or email us at biosales@fargro.co.uk

If you would like to talk about any of the IPM products or would appreciate technical advice, please feel free to call **01903 256 856** or email technical@fargro.co.uk.



CONTENTS

A

Aphid Control 03-05

C

Caterpillar Control 06

Chafer Grub Control 07

L

Leafhopper Control 07

Leaf Miner Control 07

Leatherjacket Control 08

M

Mealybug Control 08

N

Nematodes 06, 14

P

Pheromone Traps..... 19

Pollination 17

R

Roller Traps 18

S

Scale Insect Control 09

Sciarid Fly Control 09

Shore Fly Control 10

Slug - Biological Control 11

Spider Mite Control 11

Sticky Traps 18

T

Thrips Control 13

Traps 18

Traps Pheromone 18

Traps - Sticky 18

V

Vine Weevil Control 15

W

Whitefly Control 16

Under the Sustainable Use Directive, Integrated Pest Management (IPM) is now the mainstay of modern crop protection. Biological control is an essential part of a full IPM programme which also includes cultural control, hygiene, control of environment as well as careful crop monitoring.

- Biocontrol agents work better preventatively in a programme of introductions or when introduced at the very first sign of a pest
- Some selective pesticide products can be used as part of a complete programme or to correct a pest imbalance but it is important to check their compatibility before use
- Some broad spectrum persistent insecticides can persist for up to 10 weeks damaging beneficial insects and mite populations
- Specifications and availability may change with time owing to advances in production techniques and changes in the regulatory environment

This section concentrates on beneficial insects and mites. Fargo understand IPM and are always seeking to offer the best controls to suit grower requirements.

For more biological control information please contact us:

Call: 01903 256 857

Email: biosales@fargo.co.uk



APHID CONTROL

Most crops can be attacked by aphids. Damage is caused in three ways: sucking plant sap when feeding so reducing plant vigour, excretion of honeydew leading to sooty mould and some species can transmit plant viruses leading to distortion and disfigured plant growth.

Biological control with parasitoids, predators and fungal pathogens is available depending on crop and environmental conditions. There are a large number of aphid species and identification can be important when parasitic wasps are to be used. Depending on the aphid species there can be alternate plant hosts. Winged forms develop under conditions of high density to migrate to alternate hosts. Resistance to some insecticides is a serious issue with some species.

Parasitic Wasps

The adult wasp inserts its egg into the aphid, a parasite larva develops killing the aphid, producing a characteristic golden brown papery 'mummy' with *Aphidius* and *Praon* species, and black 'mummy' with *Aphelinus* species. Aphids parasitised with *Ephedrus* hide to die.

An adult parasitic wasp later emerges through a round hole on the mummified aphid. The adult wasps also feed as a predator on aphids, killing one or more each day.

Parasitic wasps should be used at the first sign of aphids or better as an early season preventative

Species of parasitic wasp available:

Aphidius colemani

Particularly effective against round bodied aphid species such as *Myzus persicae* (peach-potato aphid) and *Aphis gossypii* (melon cotton aphid).

They are not effective against *Aulacorthum* or *Macrosiphum* species. It can control large populations of aphids, but will take time to achieve this and may leave many parasitised 'mummy' bodies on plants.

Aphelinus abdominalis

Controls a wide range of aphid species including *Macrosiphum euphorbiae* (potato aphid) and *Aulacorthum solani* (glasshouse potato aphid). It has a very long life span.

Aphidius ervi

Specifically for the larger elliptical shaped species including *Macrosiphum euphorbiae* (potato aphid) and *Aulacorthum solani* (glasshouse potato aphid). Several other aphid species such as the pea aphid are also parasitised.

Aphidius matricariae

Has a slightly different host range to *A. colemani* and includes *Ovatus crataegarius* (mint aphid).

Ephedrus cerasicola (Mixtures Only)

Has a long life cycle and high rate of egg laying capacity. Effective on a wide range of aphid species.

Praon volucre (Mixtures Only)

Controls a wide range of aphid species including a number not controlled by other available aphid parasites and has a long life cycle.



Formulations

Aphiline c

Aphidius colemani

F/CODE	PACK
FGAPK	Vial of 500 Mummies/Adults
FGAPL	Vial of 1,000 Mummies/Adults
FGAPN	Bottle of 5,000 Mummies/Adults

Apheline ab

Aphelinus abdominalis

F/CODE	FGAPA
PACK	Vial of 250 Mummies/Adults

Aphiline Veg (ACE) Mix

This mix contains *Aphidius colmani*, *A. ervi*, *Aphelinus abdominalis*.

F/CODE	FGAPC
PACK	Vial of 500 Mummies/Adults

Erviline

Aphidius ervi

F/CODE	FGAPO
PACK	Bottle of 250 Mummies/Adults

Aphiline m

Aphidius matricariae

F/CODE	FGAPS
PACK	Vial of 500 Mummies/Adults

Aphiline CE Mix

This mix contains *Aphidius colmani*, *A. ervi*.

F/CODE	FGAPD
PACK	Vial of 500 Mummies/Adults



Release pack for flower mix similar for berry and strawberry mixes



Image of 'Mummified' aphid - parasitised by *Aphidius* spp. (Holt Studios)



Aphelinus - Egg laying into aphid (Holt Studios)



Aphidius - Egg laying into aphid (Holt Studios)

Aphiline Berry Mix (MACE PV) Mix

This mix contains *Aphidius Colmani* (40), *A. ervi* (40), *A. matricariae* (40), *Aphelinus abdominalis* (20), *Praon volucre* (100).

F/CODE	FGAPV
PACK	Release Pack of 240
APPLICATION RATE	One Release Pack of 240 Treats 200m ²

Aphiline Flower Mix

This mix contains *Aphidius Colmani* (30), *A. ervi* (30), *A. matricariae* (30), *Aphelinus abdominalis* (40), *Praon volucre* (40) and *Ephedrus cerasicola* (70).

F/CODE	FGAPX
PACK	Release Pack of 240
APPLICATION RATE	One Release Pack of 240 Treats 200m ²

Aphiline Strawberry Mix (PACE PEVC)

This mix contains equal portions of *Aphidius Colmani*, *A. ervi*, *A. matricariae*, *Aphelinus abdominalis*, *Praon volucre* and *Ephedrus cerasicola*.

F/CODE	FGAPW
PACK	Release Pack of 240
APPLICATION RATE	One Pack of 240 Treats 200m ²

Introduce at the rate of one wasp or mummy per 2m² per week for *Aphidius colemani*, *Aphidius ervi*, *Aphidius matricariae* and *Aphelinus abdominalis*. For Veg mix (ACE) and CE mix a rate of one wasp per m², Aphiline Berry, flower and strawberry mix are supplied in a release pack to treat 200m².

The mixtures reduce the need for accurate pest species identification and are suitable preventative use against a range of aphid species. Particularly in mixed cropping situations.

For more information please contact Fargro.

We also provide a range of biopesticides products that can be used in conjunction with biological controls.

Contact our Technical Team

Call: 01903 256 856

Email: technical@fargro.co.uk

Aphidoline

Aphidoline *Aphidoletes aphidimyza*

A small orange predatory larvae, the adult is a nocturnal midge fly.

Introduced as cocoons/pupae from which adults emerge. The blister packs enable monitoring and mating of adults on release. Adults lay eggs next to aphid colonies located by the scent of honeydew, larvae develop as tiny orange larvae that feed on aphids.

One larva can survive on 5 large aphids but will kill up to 35 or more.

Larvae feed on over 60 aphid species, including those common in field and protected crops within the UK.

Apply between April and September for re-cycling generations, however they can be used all year round if supplementary lighting is available.



Aphidoletes larvae feeding in aphid colony (Holt Studios)

F/CODE	PACK
FGAPJ	Bottle of 1,000 Pupae
FGAPR	Blister Pack of 250 Pupae x 4
APPLICATION RATE	
Normally 1 pupae per m ² per week, for local hotspots increase the rate up to 10 per m ² a pack will treat between 100-1000m ² depending on pest levels.	

Chrysoline

Chrysoline *Chrysoperla carnea*

Young larvae of predatory lacewing.

An extremely active predator with large pincers used to attack, hold and suck the juices from the pest body.

Effective at controlling established aphid populations. Also feed on whitefly eggs and scales, thrips larvae, moth eggs, young mealybug nymphs and other small insects.

F/CODE	PACK
FGWIM	Tube of 500 Larvae
FGWIN	Tube of 1,000 Larvae
FGWIR	Bulk Bag of 2,500 Larvae
HOW TO USE	
Use on established populations of aphids or other pest colonies, ideal for organic crops.	
APPLICATION RATE	10 larvae per 1m ² repeat after 2-3 weeks.



Chrysoperla larvae feeding on aphid (Holt Studios)

Adaline

Adaline *Adalia bipunctata*

A species of ladybird native to the UK. The adult beetle and larvae are both predatory and feed on most types of aphid. Apply as a curative.

Can be used on protected crops and outdoor/garden crops.

F/CODE	PACK
FGADB	Vial of 25 Adults
FGADC	Bottle of 250 Larvae
HOW TO USE	
Apply as a curative.	
APPLICATION RATE	2-10 per m ²



Adalia adult (Bioline)



Adalia larva (Bioline)



CATERPILLAR CONTROL



Many species of Lepidoptera lay their eggs on to commercial crops where their caterpillars can cause extensive damage. Currently the primary biological control is the nematode, *Steinernema carpocapsae*, while the predatory bug *Macrolophus*, (see whitefly section page 17) and lacewing larvae (see aphid section page 05) will both feed on moth eggs as well as young caterpillar.

Pheromone traps can be used to monitor adult moth activity of a number of species. Lepinox Plus (*Bacillus thuringiensis subspecies kurstaki*) is a biopesticide spray with curative activity for caterpillar.

Exhibitline Sc

Steinernema carpocapsae

Insect parasitic nematodes. Application releases nematodes which seek out insect larvae and in some cases pupae.

Controls overwintering stages of codling moth (*Cydia pomonella*) and oriental fruit moth (*Cydia molesta*) and other caterpillar species. Also used for shore fly (*Ephydriidae*) and can be used for large pine weevil control.

For caterpillar control wet the area prior to spraying directly onto caterpillars. Repeat every five to fourteen days. 50 million treats 100m².

For control of codling moth and oriental fruit moth overwintering stage, apply as a coarse spray to trunks and soil, ensuring the target area remains wet for a period of at least 8 hours at a rate of 50 million per 30m². Minimum 12°C ground/soil temperature for activity.

F/CODE	PACK
FGYRT	Tray of 50 Million
FGYRS	Tray of 250 Million



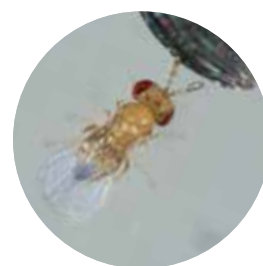
Nematodes
(Holt Studios)

Tricholine b

Trichogramma Species

A minute parasitic wasp. The adult wasp lays eggs inside the eggs of many moth species but tends to be more efficient where groups of eggs are laid together. Use as part of an integrated approach in combination with pheromone monitoring (see traps on page 18), to detect the presence of adult moths and to time sprays.

F/CODE	PACK
FGCAT	10,000 on Cards
APPLICATION RATE	
10 wasps per m ² when moths are active. Can be used all year round when supplementary lighting is used.	



Trichogramma
(Holt Studios)

Lepinox plus is an approved biological insecticide for the control of caterpillar.



Lepinox[®] Plus

CHAFER GRUB CONTROL

Adult beetles of the Garden Chafer (*Phyllopertha horticola*) emerge in May/June and mate. Females burrow into the ground to lay their eggs. Eggs hatch about 4 weeks later forming characteristic "C" shaped grubs – staying close to the soil surface until early October after which they move deeper over-winter. They pupate the following April. Chafer grubs cause damage to turf by feeding on roots and by predators (rooks, crows etc.) excavating the grubs.

Affected turf may have all roots severed. Predators may tear at the turf removing divots to expose the grubs causing further damage.

Exhibitline Hb

Heterorhabditis bacteriophora

Used to control vine weevil and the chafer grub *Phyllopertha horticola* present in turf. Other species of chafer grub such as cockchafer *Melolontha* may not be adequately controlled owing to difference in life cycles.

F/CODE	PACK
FGYRO	50 Million
FGYRP	250 Million
APPLICATION RATE	
250 million pack treats up to 500m ² , 50 million pack treats up to 100m ² .	

LEAFHOPPER CONTROL

Leafhoppers are related to aphids, they suck out the contents of individual plant cells which are then replaced by air, giving the characteristic bleached white spots on the leaves of infested crops. Eggs are deposited singly into the leaf veins from the underside of the leaf. Lacewings (*Chrysoline*) (see aphid control page 05) and *Macrolophus* (see whitefly control page 17) will both feed on leafhopper nymphs, but no biological control is available for the adults.

Some IPM compatible pesticides are available. Use of yellow or red sticky traps to attract adults can also be used as control.

LEAF MINER CONTROL



Several species of leaf miner are found in the UK on a wide range of crops but all produce the characteristic 'mines' within the leaf, in which the larvae feed. Adult feeding produces small discrete white spots (1mm diameter) on the leaves, usually on the upper leaf surface.

The larval stages inside the leaf can be controlled using parasitic wasps. Some leaf miner species are notifiable insect pests. Correct identification by PHSI (Plant Health and Seeds Inspectors) for any suspect insects is essential.

Digline

Diglyphus isaea

A parasitic wasp. The adult wasp lays its eggs next to the leaf miner larvae, damage ceases immediately as the larvae are paralysed. The wasp parasite larvae then feed on the leaf miner larvae. Adult females kill and feed directly on leaf miner host larvae that are too small to support a developing parasite larva.

Controls *Liriomyza* (tomato leaf miner) and *Phytomyza* (chrysanthemum leaf miner).

Ideal for use from mid-February in heated crops and April in unheated crops. Establishment will only occur if the wasp is released when sufficient numbers of reasonable sized larvae are present within the crop.



Diglyphus isaea
(Holt Studios)

F/CODE	PACK
FGMID	Vial of 250 Adults
APPLICATION RATE	
1 wasp per m ² every week for 2-4 weeks.	



LEATHERJACKET CONTROL



Leatherjackets, the larvae of the crane fly (daddy-long-legs) attack the roots of a number of plants and damage lawns. Outdoors, eggs are laid in late summer to early autumn. Larvae then feed on plant roots and may damage the plant stem bases pupating early the following summer. On turf, birds looking for prey will cause further damage.

Exhibitline Sf

For control of leatherjackets on lawns, the microscopic nematodes swim through moist soil and attack the leatherjacket larvae. The soil must be between 10-30°C at time of application. Apply when leatherjackets are close to the soil surface, usually August to October when they are still small. A moist ground is required. 250 million pack will treat 500m². For pack sizes see thrips section, see page 13.

MEALYBUG CONTROL



Mealybugs are related to aphids and feed by sucking plant sap, causing damage directly via feeding and by production of honeydew and associated sooty moulds. Several species are found, all have the appearance of being covered in a white waxy layer.

They are serious pests in botanic gardens, interior landscapes and in commercial ornamental and edible crops. *Cryptolaemus* ladybirds and parasitic wasps are available for control under warmer conditions. Lacewing larvae (see aphid control page 05) also feed on mealybug nymphs. *Hypoaspis* (see sciarid control page 09) may feed on root mealybug. A pheromone is available for the citrus mealybug that attracts the winged adult males of several species.

Fightameal A

Cryptolaemus montrouzieri

The Australian ladybird. The larvae looks like a large segmented mealybug and may be seen walking over plants. Adults lay eggs into mealybug egg masses, larvae develop and are predatory on all stages of the mealybug. The larvae feed on all species but adults need egg producing species for egg laying.

Apply at first signs of infestation.

Requires a minimum temperature of 16°C.



Cryptolaemus larva
(Holt Studios)



Cryptolaemus adult
(Holt Studios)

F/CODE	PACK
FGMEA	Vial of 10 Adults
FGAME	Vial of 25 Adults
FGAMD	Vial of 100 Adults
FGAMF	Vial of 250 Adults
FGAMI	Vial of 10 Larvae
FGAMH	Vial of 25 Larvae
APPLICATION RATE	
2-3 ladybirds per m ² on infested plants, repeat at 2 week intervals until predators are established.	

Mealybug Parasite Mix

Small parasitic wasps. Adults lay their eggs inside the mealybug nymphs which continue to develop for a few days before becoming brown and mummified. The parasite emerges through a circular hole in the top.

There are no parasites available in the UK for some species such as the long-tailed mealybug *Pseudococcus longispinus*.

Requires temperatures of 18-30°C for development.

F/CODE	PACK
FGMEG	Vial of 50
APPLICATION RATE	
2 wasps per m ² infested area.	



Leptomastix adult on mealybug colony
(Holt Studios)

SCALE INSECT CONTROL



A mostly sedentary pest found on the undersides of leaves and on the stems of many ornamental plant species, especially foliage plants in permanent displays. Damage may be due to copious amounts of honeydew that many species of soft scale produce and the associated sooty moulds that grow on honeydew. Armoured or hard scale insects do not produce sticky honeydew and can be more difficult to control. Dead scale insects can remain on plants for several months and may require physical removal to clean up an infection.

Control can be achieved by foliar application of *Steinernema feltiae* nematodes, *Chilocorus* ladybirds in warm conditions and lacewing (*Chrysoline* see Aphid section page 05).

Fightascale H

Chilocorus nigritus Hard Scale Predator

Predatory ladybird beetle. Eggs are laid singly, close to hard scale insect colonies. The larvae and adult of *Chilocorus* are predatory and will control most hard scale insects/species.

Use late spring to early autumn unless under lights and 18°C+ temperature can be provided.

F/CODE	PACK
FGSCH	Vial of 25 Adults
FGSCI	Vial of 25 Larvae
APPLICATION RATE	
2 beetles per m ² of infested plants, repeat at least twice at fortnightly intervals. They should establish from season to season.	

Exhibitline Sf

Steinernema feltiae

Microscopic nematodes swim through a film of water on the plant to attack the scale insects. Most species of scale insect are controlled where nematodes can be directly targeted. (These products have no label recommendation for this use but from our own trials have been found to be effective). Spray onto foliage when above 14°C and less than 27°C. For best results maintain a wet leaf for several hours after application. Activity ceases when leaves dry.

For pack sizes and more information see Exhibitline Sf under Thrips control section.

SCIARID FLY CONTROL



The adult flies are commonly found making short hops over the compost surface. Adults can spread fungal diseases but most damage is caused by the larval stage feeding on plant roots making them vulnerable to disease infections such as *Pythium* and other damping off diseases.



Hypoaspis predatory mite
(Holt Studios)

Hypoline

Hypoaspis miles (Stratiolaelaps scimitus)

A predatory mite which feeds on sciarid fly larvae and other 'soil' pests including springtails, thrips pupae and root mealybug. At night they move a short distance up, on to the plant foliage and will feed on mealybug and other soft bodied prey. Mites are very mobile and soon distribute themselves throughout the crop. Adults are reported to live for several months and survive up to 50 days without food, making them ideal in situations of very low pest populations.

Controls *Bradysia* spp. and many other insect or mite pests.

Introduce into most growing media including artificial substrates.

Use as a preventative or at the first sign of sciarids. Requires a minimum temperature of 12°C.

F/CODE	PACK
FGGRB	Tube of 10,000
FGGNA	Tube of 25,000
FGGRC	Bag of 125,000
APPLICATION RATE	
100 mites per m ² usually as a single application. For permanently planted areas (interior landscapes, botanic gardens etc.) re-introduce every 10 to 12 weeks.	

Exhibitline Sf

Steinernema feltiae

Nematodes swim freely through moist compost (but they can drown if waterlogged), they are attracted to insect larvae and enter the body where a pellet of bacteria is released that kills the pest organism.

Controls *Bradysia* spp. and other compost / soil living pests such as larvae / pupae where nematodes can enter the host body. Can also be used as a foliar spray for Western Flower Thrips, leafminer and scale insect control.

Use as a curative treatment or programmed application for each batch of plants. The temperature range is 12 to 25°C.

For pack sizes and more information see Exhibitline Sf under Thrips control section.

APPLICATION RATE

A 50 million pack will treat 50m² as a curative treatment, and 100m² as a protectant treatment (growing media drench).

Staphyline

Atheta coriaria (*Dalotia coriaria*)

Adults and larvae of a Staphylinid beetle. 2-3mm rove beetle feeds on the larvae and adults of a range of growing media pests. Controls sciarid and shore flies. The effective temperature range is 12-35°C.



Atheta coriaria adult
(Bioline)



Atheta coriaria larva
(Bioline)



Bucket Breeder System

- 500 adults
- Breeder bucket
- Breeder mix
- Food blend scoop
- Instructions

Designed to give continuous release of beetles over an extended period.

F/CODE	PACK
FGATH	Tube of 500
FGATG	Tub of 3,000
FGATA	Bucket Breeder System
APPLICATION RATE	
Use 5-10 insects per m ² .	

SHORE FLY CONTROL

Often confused with sciarid flies these feed and are associated with algae. Although not directly feeding on crop plants they spread plant disease and both the fly and their frass can be a contaminant in food or ornamental crops. Most of the controls for sciarid fly are not effective on shore fly.

Exhibitline Sc

Steinernema carpocapsae

Insect parasitic nematodes seek out insect larvae.

Controls shore fly (Ephydriidae). The same nematode can also be used for caterpillar control. Apply as soon as pest is seen, reapply weekly.

F/CODE	PACK
FGYRT	50 Million
FGYRS	250 Million
APPLICATION RATE	
50 Million per 100 m ² .	

Staphyline

Atheta coriaria (*Dalotia coriaria*)

Adults and larvae of a Staphylinid beetle. 2-3mm rove beetle feed on the larvae and adults of a range of growing media pests. Controls sciarid and shore flies. The effective temperature range is 12-35°C.

For more details see Staphyline product above under sciarid fly control.

SLUG CONTROL

Slugs are common pests of many horticultural crops, particularly soil grown plants and in nursery stock where small water snails are of equal importance.

Nemaslug

Phasmarhabditis hermaphrodita

Microscopic nematodes seek slugs and water snails, they enter the body and start to develop from infective juveniles to adults. In doing so a pellet of bacteria is released that begins to multiply spreading through the host body. Infected slugs are noticeable by the swollen mantle on their back, this ruptures a few days later releasing thousands of nematodes that seek to infect further hosts.

Controls most slug species including *Arion* and *Deroceras* spp. and some snail species including those which are commonly found on nurseries.

Use almost any time of year when soil temperatures are between 5 and 30°C. Soil moisture should not be a problem in commercial horticulture, unless the area dries up completely.



F/CODE	PACK
FGXEO	30 Million
APPLICATION RATE	
Single application one 30 million pack treats 100m ² .	

SPIDER MITE CONTROL

The glasshouse spider mite or two spotted spider mite (*Tetranychus urticae*) is a common pest of protected crops with adult females laying up to 120 eggs in 3 weeks. Motile stages suck the contents out of plant cells and produce characteristic leaf damage of white or silvery speckled patches.

Almost all protected crops and soft fruit are vulnerable to infestation. Other spider mites attack plants too, so identification of species is important for correct biological control.



Spider mite webbing on rose (Bioline)



Spider Mite symptoms on tomato leaf (Bioline)



Adult Two Spotted Spider Mite with larva and egg (Bioline)

Phytoline

Phytoseiulus persimilis

Small orange/red predatory mite, has been used for over 50 years.

The predatory mite actively hunts and attacks all stages of mite. Very effective against on *Tetranychus* spp. (two spotted spider mite).

Can be used on protected edible and ornamental crops as well as outdoor soft fruit. Cannot establish in the absence of spider mites (*Tetranychus* spp.) and performs best in warm, relatively humid conditions but may fail in hot, dry conditions.

F/CODE	PACK
FGMIH	Bottle of 1,000 125ml in Vermiculite
FGMIU	Bottle of 2,000 250ml in Vermiculite
FGMIV	Bottle of 2,000 250ml in Sawdust
FGMIT	Bottle of 2,000 500ml in Vermiculite
FGMIP	Flip Top Vial of 2,000 in Vermiculite
FGMII	Bottle of 10,000 500ml in Vermiculite
APPLICATION RATE	
5-10 mites per m ² . Some low humidity crops or indoor atria may require twice this rate.	



Vial with flip top lid



Phytoseiulus adult with egg (Holt Studios)



Californiline

Amblyseius californicus (*Neoseiulus californicus*)

Small predatory mite. Adults and nymphs feed on spider mite eggs, nymphs and some adults. In the absence of mites they feed on pollen and other prey. Controls fruit tree spider mite (*Panonychus ulmi*) and glasshouse spider mite (*Tetranychus urticae*).

Suitable to seed a crop as a preventative treatment or when hot, dry conditions prevail.

This predator is released only under licence for use on glasshouse grown crops, please contact Fargro for further details.



Amblyseius californicus
(*Neoseiulus californicus*)
(Holt Studios)

F/CODE	PACK
FGCAL	Bottle of 2,000
FGCAM	Tube of 25,000
FGCAN	100 Gemini Sachets
FGCAO	200 Mini Sachets with Hook
APPLICATION RATE	
5-10 per m ² at 2-3 weekly intervals.	

Anderline

Amblyseius andersoni

Predatory mite preys on eggs, larval and adult stages of a range of mite species including glasshouse spider mite, citrus mite, fruit tree spider mite, rust mite and thrips. Able to survive on pollen, fungal spores and plant sap in absence of prey and hence can be applied preventatively. Survives high and low temperature but low humidity limits development.

Controls glasshouse spider mite and other spider mite species.

Use preventatively. The slow release sachets allow release over a 6 week period from a breeding colony.



Amblyseius andersoni
(Holt Studios)

F/CODE	PACK
FGMIY	Tube of 25,000
FGMIX	5lt Bag of 125,000
FGMIW	100 Gemini Sachets
FGMZX	200 Mini Sachets with Hook
FGMJA	Bugline 6 x 100m Roll (One sachet in 6 is filled)
APPLICATION RATE	
One twin gemini sachet per 1-2m ² provided continuous leaf canopy.	

Feltiline

Feltiella acarisuga

A predatory midge lays orange/red eggs amongst spider mite colonies that after three to five days hatch to minute orange coloured larvae.

These feed on all stages of spider mite and can eat up to 15 eggs, five young mite or three mature mites each day.

Optimal conditions include 80% humidity and temperatures between 20-27°C.



Feltiella acarisuga
(Holt Studios)

F/CODE	PACK
FGMIB	Tub of 250
APPLICATION RATE	
One tub should treat 1000m ² . Repeat 4 times at weekly intervals, until cocoons/pupae appear on foliage.	

SB Plant Invigorator

Controls a wide range of important pests including whitefly, aphid, spider mite, mealybug, scale and sciarid and also powdery mildew. Works as an insecticide/acaricide/fungicide by a physical mode of action.

THRIPS CONTROL



Two species of thrips are commonly found on protected crops: Western Flower Thrips (WFT), (*Frankliniella occidentalis*) and Onion or Tobacco Thrips (*Thrips tabaci*). Larvae and adults pierce the leaf surface and suck out cell contents causing extensive 'silvering'. WFT can also transmit many viruses to crops.

Other species of thrips are also being found, particularly on specimen plants. There is a pheromone for monitoring of Western Flower Thrips.

Amblyline

Amblyseius cucumeris (*Neoseiulus cucumeris*)

Predatory mite feeds on young thrips larvae, and in the absence of thrips, on pollen.

Many thrips species are controlled including tarsonemid mite (good control on cyclamen and strawberry) and broad mite.

Always use preventatively on peppers, cucumbers, pot and bedding plants, strawberries and cyclamen.



Amblyseius cucumeris
(Holt Studios)



F/CODE	PACK
FGTHC	Bran/Vermiculite 1lt Tube of 50,000
FGTHK	Bran Free 1lt Tube of 50,000
FGTHJ	Bran Free 5lt Bag of 50,000
FGTHZ	Bran/Vermiculite 5lt Bag of 250,000
FGTHH	Bran Free 5lt Bag of 250,000
FGTHT	CRS Formulation 5lt Bag of 100,000
FGTHD	Sachet (CRS) with Hooks, Box of 200
FGTHO	Gemini Sachets, Box of 300
FGTHG	Mini Sachets with Hooks, Box of 400
FGTHS	Sachets without Hooks, Box of 500
FGTJS	Sachets on Sticks, Box of 500
FGTJA	Bugline 100m Roll, Box of 6 (One sachet in 3 is filled)
APPLICATION RATE	
Shaker bottle: 50-250 mites per m ² Controlled Release System (CRS). Gemini sachet: 1 sachets per 1 to 2 m ² or one sachet per plant.	

Oriline

Orius laevigatus & *O. majusculus*

Voracious predator of thrips and other soft bodied insects such as aphids. They often kill far more thrips than they need to reach maturity. *Orius* will attack all stages of thrips on plants.

Ideal to control established thrips populations on a range of plants and can be used alongside other biologicals.

O. laevigatus (*Oriline l*) performs well on the majority of crops, particularly those with pollen producing flowers. *O. majusculus* (*Oriline m*) establishes better on cucumber or non pollen producing plants.



Orius laevigatus feeding on a thrips larva
(Holt Studios)

F/CODE	PACK
FGBUO	<i>O. laevigatus</i> Nymhs/Adults Bottle of 500
FGBUN	<i>O. laevigatus</i> Nymhs/Adults Bottle of 1,000
FGBUP	<i>O. laevigatus</i> Nymhs Bottle of 2,000
FGBUQ	<i>O. majusculus</i> Nymhs/Adults Bottle of 500
APPLICATION RATE	
0.5 to 1 per m ² every 2 weeks until established.	

Montyline

Amblyseius montdorensis (*Typhlodromips montdorensis*)

A predatory mite that can survive in the absence of prey feeding on pollen. Predates on whitefly (eggs and larvae), as well as thrips. It will not control established populations or where large numbers of adults are moving into the crop. Consumes more thrips per day than the standard *A. cucumeris* and unlike *A. cucumeris* will predate on second instar thrips. Populations have the potential to grow faster than *A. cucumeris*.

Introduce early into the crop cycle to protect.

Requires minimum temperatures of 15°C night and 20°C day.

This predator is released only under licence for use on glasshouse grown crops, please contact Fargro for further details.



Amblyseius montdorensis
(Holt Studios)

F/CODE	PACK
FGMOB	1lt Tube of 25,000
FGMOC	5lt Bag of 125,000
FGMOE	Sachet with Hook, Box of 500
FGMOA	Mini Sachet with Hook, Box of 1,000
FGMOD	Gemini Sachets with Hook, Box of 500
FGMOF	Bugline 100m Roll, Box of 6 (One sachet in 6 is filled)
APPLICATION RATE	
50-100 mites per m ² 1 sachet per m ² or per plant. Bugline should be spaced 1m apart across each crop.	



Nematodes
(Holt Studios)

Exhibitline Sf

Steinernema feltiae

The nematodes swim through a film of water and attack female thrips. Controls adult female Western Flower Thrips. Larvae are not always attacked but pupae frequently are. Also controls leafminer.

Can be used at any time of the year, ideal at temperatures above 16°C. Do not use under strong lights or when the sprayed crop is likely to dry within 3 to 4 hours. A series of 4 or 5 weekly sprays is best to control a thrips population.

F/CODE	PACK
EXYFH	50 Million
EXYFL	250 Million
EXZFL	50 Million x 5
EXYFK	250 Million x 5
APPLICATION RATE	
250 million pack treats 1000m ² (standard rate). 2000m ² (preventative rate).	

Naturalis-L

Beauveria bassiana
(ATCC 74040)
a biopesticide
approved for
professional use.

Naturalis L is a registered as a professional insecticide, users therefore require qualifications in pesticide use. Always use plant protection products safely. Always read the label and product information before use.



Used for
whitefly, thrips
and some other
pests

VINE WEEVIL CONTROL



Black vine weevil (*Otiorynchus sulcatus*) is a major pest of nursery stock, pot plants and soft fruit production. Leaf notches around the edge of leaves indicates damage by adult weevils, this is when egg laying begins. Adults are all female, approximately 10mm long, and can lay up to 1000 eggs between June and October but over a longer period under protection.

The larvae feed mainly on roots but they will also eat corms and soft fleshy stems. It takes several months to develop from egg to adult resulting in one cycle per year on outdoor crops but multiple generations may occur on heated crops.



Vine Weevil Larvae

Exhibitline Sk/Nemasys L

Steinernema kraussei

Contains microscopic nematodes which seek vine weevil larvae in moist soil and compost. Nematodes enter the weevil larvae and release a small pellet of bacteria that kills the host after a few days.

Autumn and spring are the main seasons for nematode application, although additional treatments may be needed for heated or protected crops. It is important that the soil or compost is kept moist (not water logged).

Exhibitline Sk/Nemasys L will work as low as 5°C allowing applications to be made whenever the pest is active.

Apply as a drench using conventional sprayer, dilutor, watering can or through most irrigation lines. In all cases remove any fine filters and ensure water temperature is between 5 and 15°C.

F/CODE	PACK
FGGRE	50 Million
FGGRD	250 Million
APPLICATION RATE	
Container Plants: The 50 million pack treats up to 100 m ² , 250 million up to 500 m ² .	
Open ground treatments: The 50 million pack treats up to 50 m ² , 250 million up to 250 m ² .	

Exhibitline Hb

Heterorhabditis bacteriophora

Contains a different species of microscopic nematodes from *Steinernema kraussei* above. Under the right conditions Exhibitline Hb can be faster to act. Vine weevil larvae may turn a bright red colour when infected with *Heterorhabditis bacteriophora*.

Exhibitline Hb will control black vine weevil larvae (*Otiorynchus sulcatus*) and other soil pests and is used for garden chafer control in lawns. Exhibitline Hb is more temperature dependant than Exhibitline Sk and ensure soil or growing media temperatures are between 12 and 30°C.

F/CODE	PACK
FGYRO	50 Million
FGYRP	250 Million
APPLICATION RATE	
Container Plants: The 50 million pack treats up to 100 m ² , 250 million up to 500 m ² .	
Open ground treatments: The 50 million pack treats up to 50 m ² , 250 million up to 250 m ² .	

Nematode Weevil Stop

This product contains the nematode *Steinernema carpocapsae* formulated into a gel and packed into the base of a wooden block. Placed in the shade amongst plants the adult vine weevil seeks refuge beneath the weevil stop and becomes infected.



F/CODE	PACK
FGVST	Single
APPLICATION RATE	
A rate of 1 per 10m ² is suggested.	

Met52 Granular Bioinsecticide *Metarhizium anisopliae* var. *anisopliae* strain F52

A bioinsecticide containing a strain of a naturally occurring fungus. It is approved as a plant protection insecticide for incorporation into growing media, mulch material or soil pre-planting. Labelled for the control of vine weevil but a range of other soil inhabiting pests may be controlled. As Met 52 Granular Bioinsecticide is registered a professional insecticide, users therefore require qualifications in pesticide use. Always use plant protection products safely. Always read the label and product information.

WHITEFLY CONTROL



Adult glasshouse whitefly
Trialeurodes vaporariorum
(Bioline)

Pupa of glasshouse whitefly
Trialeurodes vaporariorum
(Bioline)

Important pests of protected crops. Adults usually found laying eggs on the underside of the youngest leaves. Newly hatched larvae are mobile for a few hours before settling as immobile 'scales' where they suck plant sap.

High numbers of whitefly produce large quantities of honeydew encouraging black sooty mould.

Encarline

Encarsia formosa

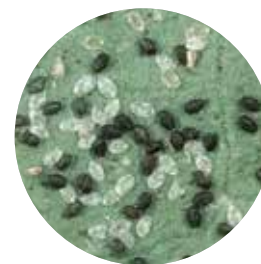
A parasitic wasp. The adult lays 60-100 eggs singly into whitefly scales, which turn black as the parasite develops.

Encarsia are introduced as pupae either on cards, which are hung within the crop or are introduced as loose black scales.

Used to control glasshouse whitefly *Trialeurodes vaporariorum* with limited control of cotton whitefly *Bemisia tabaci*.



Encarsia adult
(Holt Studios)



Encarsia Whitefly larvae and pupae some parasitised by *Encarsia* (black) (Holt Studios)

APPLICATION RATE

Cool Grown Crops	3 wasps per m ² until week 12, then 1 wasp per m ² per week.
Heated Crops	0.5-1 wasp per m ² as a preventative. Increase to 5 wasps per m ² with whitefly present.
Poinsettia	1 wasp per 3 plants per week as a preventative- 1 wasp per plant per week if <i>Bemisia tabaci</i> (cotton whitefly) is suspected.

Also available as a 50/50 mix with *Eretmocerus* (see below) to improve control of whitefly on many crops.

Eretline

Eretmocerus eremicus

A parasitic wasp. The orange/yellow coloured adult wasp *Eretmocerus* lays an egg next to and slightly below developing whitefly larva. This hatches and feeds on the whitefly larva finally pupating within the empty host skin as a light yellow 'mummy'. A small hole may be found after the adult wasp emerged from the whitefly pupa. The parasitoid can attack, kill and develop in several whitefly species including *Bemisia tabaci* (cotton whitefly) and *Trialeurodes vaporariorum* (glasshouse whitefly).

Use on heated, edible and ornamental crops (+16°C) this wasp can be used throughout the year. On other crops use late spring to late autumn; ideal for poinsettia crops.

This parasite is released under licence only.

Contact Fargro for more details.



Eretmocerus adult
(Holt Studios)

F/CODE	PACK
Eretline - <i>Eretmocerus</i>	
FGTC	20 Blister Packs Containing 250 Pupae Each (Total 5,000)
FGTA	Bottle of 3,000 Pupae
FGTE	50 Hanging Cards Containing 60 Pupae Each (Total 3,000)
FGTF	200 Hanging Cards Containing 60 Pupae Each (Total 10,000)
FGTG	250 Hanging Cards Containing 60 Pupae Each (Total 15,000)

APPLICATION RATE

2-8 wasps per m² of crop area, introduce low rate weekly or high, curative rate for a minimum of 5 to 6 weeks.

F/CODE	PACK
Encarline Mix - <i>Eretmocerus</i> mixture with <i>Encarsia</i>	
FGFIB	40 Blister Packs containing 250 Pupae Each (Total 10,000)
FGFID	250 Hanging Cards containing 60 Pupae Each (Total 15,000)

Macroline

Macrolophus pygmaeus

A predatory bug. Adults and nymphs attack all stages of pest. Used for whitefly but will also feed on leafhopper, caterpillar, leaf miner, spider mite and most soft bodied prey. Introduced early season mainly on tomatoes (not cherry tomatoes) and aubergines. In some situations can be used on ornamentals and other crops but consult Fargro for advice.

Long generation time of six weeks means that it takes time before it exerts a significant effect on the pest populations and other controls will be necessary before it is fully established. Establishment can be improved by additional feeding. See Bugfood E under Accessories, page 19.

Macrolophus nymph
(Holt Studios)



F/CODE	PACK
FGFLB	Bottle of 250 Nymphs/Adults
FGFLD	Bottle of 500 Nymphs/Adults
FGFLC	Bottle of 500 Nymphs
APPLICATION RATE	
0.5-1 per m ² , usually as a single introduction in early season.	

Swirskiline

Amblyseius swirskii

A predatory mite which can survive in the absence of prey feeding on pollen and mould. Feeds on whitefly (*Trialeurodes vaporariorum* and *Bemisia tabaci*) eggs and larvae, as well as, to a lesser extent, spider mite and thrips. It will not control established populations or where large numbers of adults are moving into the crop.

Introduce early into the crop cycle, to protect. Requires a minimum temperature of over 18°C.

This predator is released under licence for use on glasshouse grown crops, please contact Fargro for further details.

F/CODE	PACK
FGFLZ	Gemini Sachets, Box of 100
FGFLX	Gemini Sachets, Box of 500
FGFLO	Sachets with Hook, Box of 500
FGFLU	Bran/Vermiculite Tube of 25,000
FGFLW	Bran/Vermiculite 5lt Bag of 125,000
FGFMB	Bugline 100m Roll, Box of 6 (One in 6 is filled)
APPLICATION RATE	
Can be used at 50 mites/m ² or 1 sachet/m ² or per plant.	

Naturalis-L

(*Beauveria bassiana* (ATCC 74040) a biopesticide approved for professional use - see Agrochemical section page 12.

Montyline

For pack sizes and more information see Thrips page 14.

POLLINATION

Beeline Bee Hives

Bombus terrestris spp. *audax*

These hives contain a species of bee native to the UK and may be used on protected and outdoor crops to improve pollination. The hives and their number should be matched to the type of crop, area and flower numbers. Pollination is typically used in a range of protected crops such as tomato, pepper, aubergine, strawberry, raspberry, berried ornamentals and for seed production. Introduce when pollination is required. A door lock system may be closed at night when the bees have returned to the hive to keep them in. Under normal conditions the hives are maintenance free and, depending on type, will remain active for several weeks.

Tomato Hive

- Contains one queen and 60 workers and brood in all stages
- Sugar water within the box but beneath the inner hive ensures bees have a plentiful supply of liquids
- Suitable for tomatoes, aubergines and crops for seed production

Soft Fruit Hive

- Contains one queen and approximately 80 workers
- A faster acting hive with a shorter life. Used on soft and top fruit
- Also available as a triple hive, the outer box contains three hives

Compact Soft Fruit Hive

- Contains a queen and approximately 35-50 workers plus brood
- For use on smaller areas when a full size hive may cause over-pollination

Beeline Pollen

- Freeze dried pollen may be used if there is insufficient flowers or pollen for the bees



F/CODE	PACK
FGBES	Hive Compact Soft Fruit
FGBEQ	Hive Soft Fruit
FGBEP	Hive Soft Tomato
FGBER	Hive Triple Soft Fruit
FGBEG	Beeline Pollen



TRAPS

Traps are used to monitor pest populations and some offer a means of pest control. They take various forms from coloured sticky traps to pheromone lure attractant traps. Some of the most popular types are listed here.

Sticky Traps

Used to detect pest populations early before they cause damage to the crop, to monitor the success of a control measure and to provide data on long term pest problems. These traps have a dry glue covered with a paper sheet preventing traps sticking together in the pack. Traps remain sticky until covered in dust or dead insects. When monitoring replace regularly - usually every 4 weeks. Dry glue allows insect recording with a pen on each trap. For easy monitoring of insects, traps can be cut up and the paper removed in sections.

Use yellow traps for detecting activity of aphids, leaf miner, sciarid, thrips and whitefly. Use blue traps for Western Flower Thrips, red for leaf hopper.

Suspend traps about 20cm above the height of the crop.

Use one trap for monitoring 200m².



F/CODE	COLOUR	SIZE CM	UNIT
FGTRSB	Blue	10 x 24	Pack 25
FGTRSR	Red	10 x 24	Pack 25
FGTRSY	Yellow	10 x 24	Pack 25
FGTRSYBU	Yellow	10 x 24	Box 1,000

Roller Traps

Optiroll Roller Trap

Used to detect and reduce pest populations. The trap is supplied on a roll as a two sided trap with a wet glue. It is designed to be rolled out above or alongside the crop.



F/CODE	COLOUR	SIZE	UNIT
FGROLB	Blue	100m x 30cm	Roll
FGROL	Yellow	100m x 30cm	Roll

Pheromone Traps

Insect pheromones are used by insects to communicate between members of the same species. They are usually very specific and can be used in monitoring traps and in some circumstances for pest control.

Thripline lures for Western Flower Thrips (WFT)

Advanced monitoring system for Western Flower Thrips. Contains a synthetic version of a sexual aggregation pheromone for Western Flower Thrips *Frankliniella occidentalis*. The natural pheromone produced by the male WFT attracts both male and female into mating aggregations. Designed to improve sensitivity of monitoring traps for WFT only. Traps should be hung 30-50 cm above the crop.

For monitoring purposes use 100 traps per ha placed 10m apart along rows. In mixed cropping situations with possible variable thrips populations use more traps. Lures and traps should be replaced every 3-4 weeks or more frequently if covered with insects and monitoring is no longer possible.

F/CODE	PACK
FGTRA	Lure and Trap Pack of 10
FGTRB	Lure Pack of 10
APPLICATION RATES	
100 traps per ha placed 10m apart along rows.	

Pheromone Lure for Citrus Mealybug

A powerful pheromone attracts the winged male mealybug onto sticky traps which would not normally attract them. Use to monitor citrus mealybug activity. Unlike the female the males are short lived and fly. A number of other mealybug species also appear to be attracted. To use, attach a lure to a yellow or blue sticky trap placed in the greenhouse at a height of 1.5-2m. The lure is active for 6 weeks.

F/CODE	PACK
RUSCM	Lure Pack of 10

Pheromone Traps for Tortrix Monitoring in Ornamentals

Carnation Tortrix & Light Brown Apple Moth

Adult moths lay several hundred eggs and on hatching, young caterpillars disperse and feed on the plants. After a few days the young caterpillars spin leaves together and feed inside where they are protected from sprays applied for several weeks before pupating.

Use the pheromone traps to aid timing of tortrix control measures. A sticky trap is inserted into the base of a delta trap (see image), the base is then baited with a specific sex pheromone lure which attracts male moths. Traps are monitored to time control measures. Each delta trap must only ever be used for a single species. On ornamental crops the carnation tortrix has been the most common species but increasingly the light brown apple moth has been found. Use whenever there is a risk of attack. Usually installed at the beginning of the season and maintained well into the autumn.

Place just above crop height with 50m between each trap. Lures and sticky bases need to be replaced every 5-6 weeks. Each 2 trap system comes with a set of 8 lures and 8 sticky bases. Lures should be stored in their sealed foil wrapper in a deep freeze or coldest part of a refrigerator until required. Delta traps are currently available in red or green.



F/CODE	PACK
Carnation Tortrix Moth	
RUSKIT5	2 Trap Refill Kit
RUSKIT1G	2 Trap System Green
RUSKIT1R	2 Trap System Red
Light Brown Apple Moth	
RUSKIT4	2 Trap Refill Kit
RUSKIT2G	2 Trap System Green
RUSKIT2R	2 Trap System Red
APPLICATION RATE	
A minimum of two traps per species is recommended. For outdoor crops use one trap per 1-2 ha. For protected crops use two traps per 1000m ² .	

Box Tree Moth Trap

The box tree moth (*Cydalima perspectalis*) has now become an important pest on box (*Buxus* spp.) across parts of the south of England and is spreading. Larvae feed on the foliage and within days can cause severe defoliation and dieback.

The pheromone will attract males. The traps should be in place from mid March to October. Insert a single lure per trap and replace every 6 weeks throughout the season. Unopened lures should be stored in a freezer or coolest part of a fridge until required.

To continue to use the trap order lures which are available separately.



F/CODE	PACK
RUSKIT3	Box Tree Moth Trap Kit with 6 Lures
RUSCYP	Single Box Tree Moth Lure
APPLICATION RATE	
2 per site and a maximum of 4 per ha.	

Pheromone Traps for Other Fruit, Vegetable & Ornamental Pests

Specific pheromone traps are available for:

Codling moth, plum fruit moth, fruit tree tortrix, summer fruit tortrix, strawberry blossom weevil and a wide range of other pest species in a large number of situations.

Isonet T

An approved professional plant protection product but is a mating disruption system for *Tuta absoluta* based on an insect pheromone see Agrochemicals page 16.

ACCESSORIES



Universal Release Box

A release box about 5 x 5 x 6 cm. Designed to allow beneficial insects to be placed in plant foliage.

F/CODE	FGBOX
PACK	50



Biological Control and Plant Protection

A colour handbook. Neil Helyer, N. Catlin and K Brown.

F/CODE	BIOCO1
--------	--------



Bugfood E

Made of sterilised *Ephestia* eggs. Critical for the establishment of *Macrolophus*.

F/CODE	FGEPH
PACK	Vial of 10g



Knowing and recognizing 3rd Edition

The biology of pests, diseases and their natural solutions.

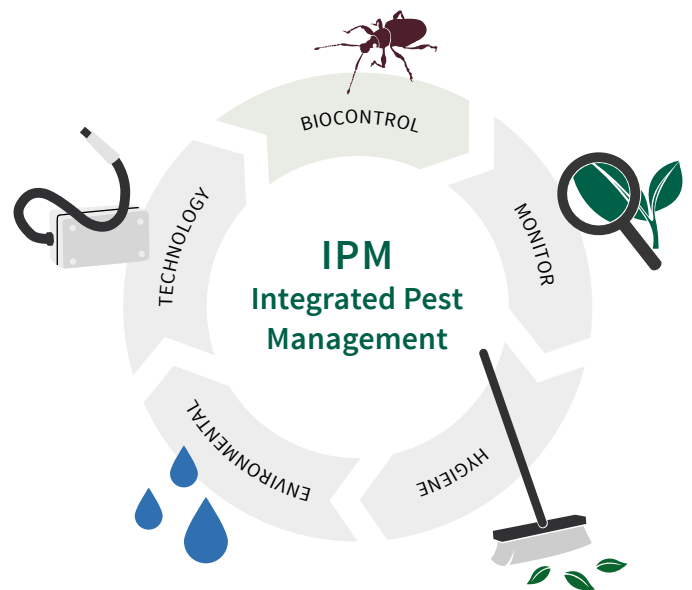
S. van der Ent, M. Knapp, J. Klapwijk, E. Moerman, J. van Schelt, S. de Weert, A. Dik and F. Schulthess.

F/CODE	BOOK1
--------	-------



If we can help design an IPM programme for you or you would like to order, get in touch on **01903 256 857** or email us at **biosales@fargro.co.uk**

If you would like to talk about any of the IPM products or would appreciate technical advice, please feel free to call **01903 256 856** or email **technical@fargro.co.uk**



fargro.co.uk

Vinery Fields, Arundel Road, Poling,
Arundel, West Sussex BN18 9PY



By Appointment
To Her Majesty The Queen
Horticultural Sundriesmen