



# Bioline

AgroSciences

Cultivating Bioalliances



# GREENHOUSE BIOCONTROL GUIDE





## 1

### Receiving and Inspecting a Shipment

Persons receiving shipments should, upon acknowledging receipt of an order, conduct an inspection to verify the following minimum conditions at arrival:

- The products conform to the purchase order requirements and other relevant documents (for example: correct product, description, size.)
- The quantity ordered against the quantity shipped or delivered
- There is no damage or breakage internally or externally
- The unit of measurement count is correct (e.g. if the unit of measurement on the purchase order is one dozen, there should be 12 in the package)
- Delivery documentation (packing list, certifications, etc.) is acceptable
- Perishable items are in good condition and expiration dates have not been exceeded
- Condition of goods
- Temperature (for perishable items)
- Moisture
- Remove all products from main packaging

## 2

### Quality Control

Persons receiving the shipment should complete all quality inspections at time of arrival, before use or storage.

## 3

### Handling and Storage

It is recommended that all beneficial products are used immediately, if this is not possible then it will be up to the customer to ensure

- Products are removed from the main packaging e.g. Boxes, air pillows, peanuts, ice pack
- Items are placed into a temperature-controlled environment of 10 degree C or 50 F ,
- Items have enough air flow around individual products to keep them temperature controlled
- Do not shrink wrap or cover product to restrict air flow
- Stored no longer than the same day if kept in a temperature-controlled environment
- Correct handling of products to ensure there is no damage to product packaging, e.g. throwing of products, over stacking, over packing
- Not stored or left in Glasshouses, tunnels, direct sunlight, high temperature or humidity areas , low temperatures, freezers
- Do not store product in its main packaging as the packaging is insulated

## 4

### Determining Acceptance

Customer should contact the supplier in a timely manner when rejecting products that are over-shipments, defective or for any other non-conformance. Failure to notify the supplier and/or distributor within 24 hrs. will mean the shipment will be considered “accepted”

# ABOUT BIOLINE AGROSCIENCES

## OUR MISSION

To offer growers efficient and innovative biocontrol solutions to help them meet the markets high quality standards.

## OUR EXPERTISE

Experts in Biosolutions for a natural, healthy and sustainable agriculture.



**200 +**  
Products



**30 +**  
Active  
countries



**11**  
Patents



**40 +**  
Protected  
crops



**30 +**  
Beneficial  
insects

**30 +**  
R&D Team



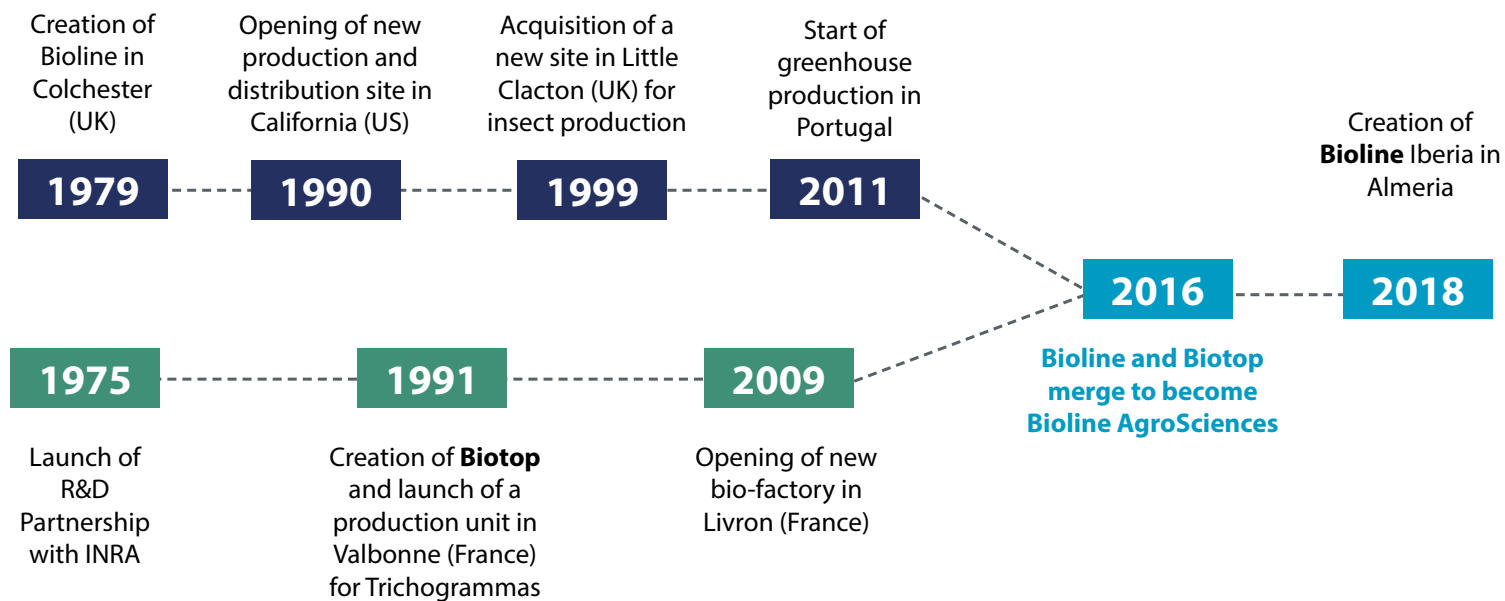
**Leader**

in trichogramma and Ephestia eggs

## WE PROVIDE MORE THAN BUGS

- Supporting growers to maintain their yields and quality, by providing innovative tools for sustainable agriculture
- Providing the highest quality products and technical advice, for use in Integrated Crop Management
- Giving all of our customers an unrivalled service and the highest standards of support
- We work with the major distributors in our markets
- Investing in our people, because their knowledge is the key to our future

# 40 YEARS OF EXPERTISE



# OUR GLOBAL PRESENCE



## BIOLINE ON DEMAND

If you require further product support or technical tips — we have multiple ways you can stay in touch 24/7 at the touch of your fingertips.

To discover further information about our products visit:  
[www.biolineagrosciences.com](http://www.biolineagrosciences.com)

For technical advice, and tips to strengthen your IPM programme download the Bioline App from mobile app stores.

Or, if you have a question, don't hesitate to tweet us at [@Bioline\\_As\\_Int](https://twitter.com/Bioline_As_Int).



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Identify your crop's pest(s) and biological control agent...

Target lifestage key



Egg



Adult



Larvae



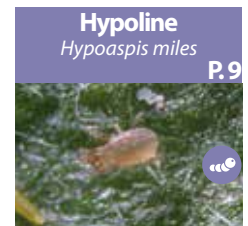
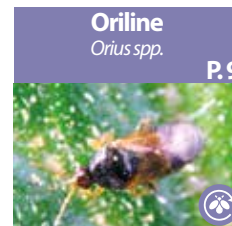
All life stages

⚠ Please be aware that not all products are available in all countries and licence restrictions may apply to some products. Consult your Bioline expert for more information.

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## Thrips Control



## Aphid Control



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# SPIDER MITE CONTROL

## SPOTTED A SPIDER MITE?

- Red or Two-Spotted Spider Mites (*Tetranychus urticae*) feed by puncturing cells and draining the contents which produce a characteristic yellow speckling of the leaf surface.
- They also produce silk webbing which is clearly visible at high infestation levels. Also at high infestation levels, reddish-brown masses of mites can be seen hanging from the tips of leaves.
- When populations of spider mite are this high, the pest can be transferred accidentally to clothing, and spread around the crop by workers.
- Spider mites are common pests on many vegetable and ornamental crops, including tomatoes, cucumbers, peppers, strawberries, roses, gerbera and many other crops.

## KEY TREATMENTS



### **Phytoline**

**Phytoline** contains the predatory mite, *Phytoseiulus persimilis*. This species is a highly active hunter and has become a standard spider mite treatment in many crops. It develops twice as fast as the spider mite at humidity levels that are above 60% (unfavourable to spider mites, favourable to *Phytoseiulus*), which allows a rapid control of outbreaks. A female *Phytoseiulus* can destroy ten spider mite females and their progeny in just seven days under optimum conditions. It is less effective on *T. cinnabarinus*.

**Target Crops** » Vegetables, Ornamentals, Berries, Fruit trees & Citrus

**Target Pest** » Two-Spotted Spider Mite (*Tetranychus urticae*)

**Target Life Stage** » 

**Delivery Systems** » Bottles, Vials & Blisters



### **Anderline**

**Anderline** contains the predatory mite, *Amblyseius andersoni*. This species feeds on a wide range of mites and small insects, as well as eating plant pollen. This varied diet makes it easy to establish high populations of Andersoni, which are perfect for preventive control of spider mites and other mite pests. Anderline is effective even with low temperatures.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Black Vine Weevil

**Target Life Stage** » 

**Delivery Systems** » Powder or Gel



## **Macroline**

*Macrolophus pygmeus* (formerly *caliginosus*), a Mirid bug, is a highly mobile predator that is used to control a wide range of insect and mite pests. It is important to establish strong populations of *Macrolophus* before pest populations build up, therefore, regular releases should be made early in the crop cycle.

**Target Crops** » Vegetables

**Target Pest** » Whitefly, & Lepidoptera, Spider Mites including, *Tetranychus urticae*, *Tetranychus cinnabarius*, *Panonychus ulmi*)

**Target Life Stage** » 

**Delivery Systems** » Bottles



## **Californiline**

**Californiline** contains the generalist predatory mite, *Amblyseius californicus*. This species can be used at higher temperatures and lower humidities than *A. cucumeris* or *A. andersoni*, making it a great Broad mite predator in challenging environments. Broad mites live in the crowns of plants and emerge onto the leaves in sunshine or warm temperatures. *A. californicus* can follow the small mites into the crown and eliminate populations easily. Use of loose product in high numbers allows an instant curative treatment while CRS introductions give longer more preventative control.

**Target Crops** » Vegetables, Ornamentals, Fruit trees, Citrus & Berries

**Target Pest** » Broad Mite, Cyclamen Mite, Spider Mites (including *Tetranychus urticae*, *Tetranychus cinnabarinus*)

**Target Life Stage** » 

**Delivery Systems** » Sachets, Bottles & Tubes



## **Feltiline**

*Feltiella acarisuga* (formerly known as *Therodiplosis persicae*), is a predatory Cecidomyid midge. This species is highly specialist for feeding on spider mite. The larvae are a translucent to yellow-ish colour and feed exclusively on spider mites. This is a voracious predator which is best suited to curative control of established spidermite colonies.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Spider Mite

**Target Life Stage** » 

**Delivery Systems** » Trays



## **Stetholine**

**Stetholine** contains the predatory ladybird *Stethorus punctillum*. The adults and larvae of this species are both specialised at eating mite pests, particularly spider mites. Adult females need to eat at least 20 spider mites per day to produce eggs but when plenty of prey is available they will consume many times this amount. The larvae are also voracious predators; each one will consume approximately 240 spider mites during the first 8 days of its life. **Stetholine** is best used in combination with other products, such as **Phytoline**, **Anderline** or **Californiline**, to control spider mite populations that have increased beyond preventative thresholds. **Stetholine** is also suitable for use on crops which are stickier, where it can be harder to establish other predators.

**Target Crops** » Vegetables, Ornamentals, Berries and other

**Target Pest** » Spider Mite

**Target Life Stage** » 

**Delivery Systems** » Bottles





# THRIPS CONTROL

## WHY YOU SHOULD TACKLE THRIPS...

- *Frankliniella occidentalis* (Western Flower Thrips or Californian Thrips) are small insects originating on the West Coast of North America, which spread through much of Europe in the 1980s as a consequence of the international trade in plants.
- Western Flower Thrips adults are attracted by flower odours. Once in flowers they feed on pollen and on developing petals, causing blemishes that reduce the value of cut flowers.
- Eggs are generally laid in leaf tissue or developing fruit, and can cause small, hard, 'warts'. Feeding on developing fruit also causes damage, typically seen as a roughening and hardening of the surface.
- *Frankliniella occidentalis* is also responsible for transmission of numerous virus diseases to plants, the most important of which protected crops are Tomato Spotted Wilt Virus (TSWV) and Impatiens Necrotic Spot Virus (INSV), both affecting peppers and a wide range of ornamental crops.

## KEY TREATMENTS



### Amblyline

**Amblyline** contains the predatory mite, *Amblyseius cucumeris*, which is used to control a range of pests, including Broad mites. Broad mites live in the crowns of plants and emerge onto the leaves in sunshine or warm temperatures. *A. cucumeris* can follow the small mites into the crown and eliminate populations easily. Use of loose product in high numbers allows an instant curative treatment while CRS introductions give longer more preventative control.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips, Broad Mite & Cyclamen Mite

**Target Life Stage** » 

**Delivery Systems** » Sachets, Tubes & Bags



## Montyline

**Montyline** contains the predatory mite *Amblyseius (Typhlodromips) montdorensis*, which is a tropical/ sub-tropical species. This predator eats many more thrips per day and lays twice as many eggs compared with either *A. cucumeris* or *A. swirskii*. It is also active at slightly lower temperatures than *A. swirskii*. **Montyline** is recommended for preventative use in crops that suffer from both thrips and whitefly. Growers using Montyline also benefit from supplementary spider mite suppression, as *Montdorensis* helps to suppress early infestations.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Whitefly, Thrips, Russet Mites & Broad Mites, Spider mites (Secondary target)

**Target Life Stage** »

**Delivery Systems** » Sachets, tubes & bags



## Swirskiline

**Swirskiline** contains the predatory mite, *Amblyseius swirskii*. It is used for whitefly and thrips control but it will provide some reduction in other small pests. Ideal for protected crops in warm conditions but it can be used on non-protected crops, provided average daytime temperatures exceed 68°F/20°C. Establishment will be fastest on crops with ample pollen, as the pollen provides an alternative food source. Crops without pollen will have slower establishment but can use sachets that will continuously release mites to improve results.

**Target Crops** » Vegetables, Ornamentals, Fruit trees, Citrus & Berries

**Target Pest** » Whitefly & Thrips

**Target Life Stage** »

**Delivery Systems** » Sachets, tubes & bags



## Oriline

**Oriline** contains one of the only biological control agents that is able to kill adult thrips - *Orius spp.* This species has become a standard corrective treatment for thrips almost worldwide. It is often used as a follow up treatment after **Amblyline** or **Swirskiline** releases. It takes around 4-8 weeks to establish a population, establishing particularly well on pollen-rich crops. However, Bioline's **Oriline** product is reared in our "ACTIV" rearing system which provides faster establishment on the crop.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips, Moth Eggs (Secondary target) & Spider Mite (Secondary target)

**Target Life Stage** »

**Delivery Systems** » Bottles



## Hypoline

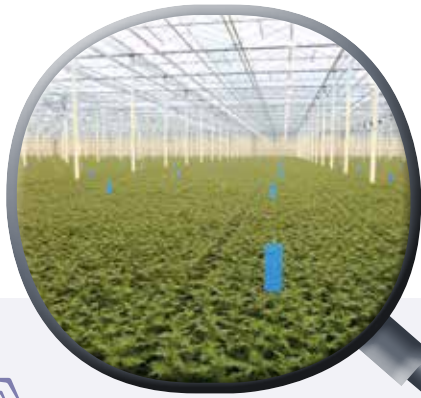
*Hypoaspis miles* (also known as *Stratiolaelaps scimitus*) is a soil dwelling predatory mite and is the biological control agent found in Bioline's **Hypoline** product. These mites aid in controlling fungus gnat larvae, Shorefly larvae and thrips pupae that drop from the plant into the growing media. This predator is usually found within the top half inch of soil or growing media.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Fungus gnats, Shoreflies & Thrips pupae

**Target Life Stage** »

**Delivery Systems** » Tubes & Bags



## Trapline

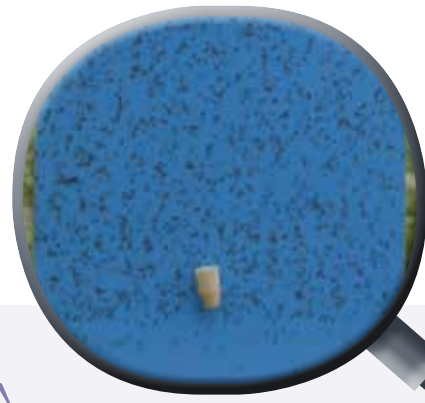
Made from a combination of high impact polystyrene with high-tech, non-drying, adhesive glue – Bioline AgroScience's **Trapline** range is scientifically optimised to enhance attraction of a range of flying insect pests. Blue traps are usually recommended for monitoring and controlling of thrips. Bioline AgroSciences also offers **Trapline t+**, a patterned roller trap with Thripline pheromone incorporated in the glue for maximum thrips attraction.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips, Whitefly, Aphid, Sciarid Flies & Leafminer

**Target Life Stage** » 

**Delivery Systems** » Cards & Roller traps



## Thripline

**Thripline** is a proprietary product containing the aggregation pheromone of Western Flower Thrips, *Frankliniella occidentalis*. The product is designed to improve the sensitivity of monitoring traps for thrips.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips (*Frankliniella occidentalis*)

**Target Life Stage** » 

**Delivery Systems** » Foil sachets





# APHID CONTROL

## ARE APHIDS ATTACKING YOUR CROPS?

- Aphids are soft bodied and rounded insects which feed on plant sap. They insert their tubular mouthparts into the transport vessels on plant leaves, stems and roots and feed on the sap which flows there. Due to this sap being rich in sugars and poor in the other nutrients which aphids actually require, they excrete excess sugars as honeydew on the plant
- The copious amount of honeydew produced encourages the growth of sooty moulds which continue to weaken the plant. Aphids are also important vectors of plant viruses and some species can also produce distortions of the leaves.
- In fact, some species can produce distortion of the leaves.
- Aphids are also important vectors of plant viruses.
- Aphids have complex biology. Some species from temperate regions alternate between different host plants in different seasons, and have sexual forms which lay overwintering eggs. Many of the common pest species don't have this sexual phase: all the individuals are female, and they reproduce throughout the year on protected crops.
- There are several common pest species which occur on a wide range of different crops: *Aphis gossypii*, *Myzus persicae*, *Macrosiphum euphorbiae* and *Aulacorthum solani*.

## KEY TREATMENTS



### **Aphiline**

**Aphiline** biological control agent contains the Braconid wasp, *Aphidius colemani*. This species is a highly effective hunter, flying throughout the crop to find aphid hosts. A female can parasitise approximately 300 aphids in her lifetime! Parasitism is manifested by immobility and swelling of the aphid, which eventually turns into a golden mummy. Once parasitised, the aphid quickly becomes harmless to the plant. 4 to 7 days after mummification (at 21°C), the adult *A. colemani* emerges and parasitises again.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Aphids

**Target Life Stage** » 

**Delivery Systems** » Bottles, Vials & Blister Packs



## Erviline

**Erviline** products contain *Aphidius ervi*, a tiny braconid wasp that stings and parasitises larger aphid species. A female can parasitise about 300 aphids in her lifetime. Parasitism is manifested by immobility and swelling of the aphid, which eventually turns into a light-brown mummy from which a new parasitoid emerges by piercing a round, regular opening. **Erviline** is a complementary product for **Aphiline**, together these products parasitise a wide range of aphid pests.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Large Aphid species (*Aulacorthum solani*, *Macrosiphum euphorbiae*, *Myzus sp.*, *Sitobion sp.*, *Schizaphis sp.*, *Rhodobium sp.* & *Acyrtosiphum sp.*)

**Target Life Stage** » 

**Delivery Systems** » Vials



## Aphidoline

**Aphidoline** products contain the predatory gall midge *Aphidoletes aphidimyza*. Adults of this species are attracted to aphid honeydew and lay 60-250 eggs amongst aphid colonies. The larvae then hatch and begin feeding voraciously. Larvae bite aphids' legs, injecting a paralysing toxin and then feed on the host aphid. This product is recommended for hotspot treatments, with a single *Aphidoletes* larva able to kill more than 35 aphids during its lifetime.

**Target Crops** » Vegetables, Ornamentals, Fruit trees, Citrus & Berries

**Target Pest** » Aphids

**Target Life Stage** » 

**Delivery Systems** » Bottles & Blister Packs



## Adaline

**Adaline** products contain the predatory bug, *Adalia bipunctata*. These products are recommended for treating aphid hotspots, giving rapid reduction of established aphid colonies. Adults and larvae are both voracious predators of most types of aphid. They combine well with parasites products such as **Aphiline**, which take longer to give visible control.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Aphids

**Target Life Stage** » 

**Delivery Systems** » Vials & Bottles



## Chrysoline

**Chrysoline** contains the aphid predator *Chrysoperla carnea*. They are commonly known as Green Lacewings. The larvae are voracious predators of aphids and other small, soft bodied insects. The adults hunt for aphid colonies and lay eggs nearby, then the larvae remains in place and feeds on the aphids. This product is recommended for localised releases in hotspots - one larvae can consume up to 200 aphids.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Fungus gnats, Shoreflies & Thrips Pupae

**Target Life Stage** » 

**Delivery Systems** » Tubes & Pails



## Apheline

*Aphelinus abdominalis* is a small wasp that will sting and parasitise young stages of aphids such as : *Macrosiphum euphorbiae* and *Aulacorthum solani*.

**Aphelinus** is known to live longer than other aphid parasitoids and, therefore, offers a good complimentary product for long-term aphid prevention.

**Target Crops** » Vegetables, Ornamentals & Berries.

**Target Pest** » Aphids

**Target Life Stage** » 

**Delivery Systems** » Vials



## Aphiline M

**Aphiline M** contain the parasitoid species, *Aphidius matricariae*. This product is used to control Red Tobacco Aphid (*Myzus persicae nicotianae*), which is commonly known in Strawberries but is also an increasingly problematic pest of pepper crops. *Aphidius matricariae* will establish quickly if Red Tobacco Aphid is a specific problem. **Aphiline M** is also a useful addition to other aphid biocontrol products because it will broaden the range of target aphids.

**Target Crops** » Vegetables, Ornamentals & Berries.

**Target Pest** » Aphids

**Target Life Stage** » 

**Delivery Systems** » Vials

## Try Aphiline Mixes...

Using a mix of species that can control several different aphids means identification is not necessary. Mixes can be used in any crop where aphids can occur and where climate conditions are favourable (> 12 - 27°C) but the mix and ratios of wasps will vary dependent of the mix of aphids expected in the crop. Although adult parasitic wasps are very mobile and active, it's best to distribute them as uniformly as possible around the infested plants.

### Aphiline Veg

**Aphiline Veg** features *Aphidius colemani*, *Aphidius ervi* & *Aphelinus abominalis*.

**Target Crops** » Vegetables

**Delivery Systems** » Vials

### Aphiline Mix

**Aphiline Mix** features *Aphidius colemani* & *Aphidius ervi*.

**Target Crops** » Vegetables

**Delivery Systems** » Vials

### Aphiline Flower

**Aphiline Flower** features *Aphidius colemani*, *Aphidius ervi*, *Aphidius matricariae*, *Aphelinus abdominalis*, *Ephedrus cerasicola* & *Praon volucre*.

**Target Crops** » Ornamentals

**Delivery Systems** » Tubes

### Aphiline Berry

**Aphiline Berry** features *Aphidius colemani*, *Aphidius ervi*, *Aphidius matricariae*, *Aphelinus abdominalis* & *Praon volucre*.

**Target Crops** » Berries

**Delivery Systems** » Tubes

### Aphiline Strawberry

**Aphiline Strawberry** features *Aphidius colemani*, *Aphidius ervi*, *Aphidius matricariae*, *Aphelinus abdominalis*, *Epedrus cerasicola*, *Praon volucre*.

**Target Crops** » Strawberries

**Delivery Systems** » Tubes



# BROAD MITE CONTROL

## BEAT BROAD MITE INFESTATIONS...

- Tarsonemid mites such as Broad Mite (*Polyphagotarsonemus latus*) and Cyclamen Mite (*Phytonemus pallidus*) can cause severe damage to plants.
- The mites are tricky to see as they are not often present on the leaves that show the symptoms of damage. Primarily because they occur in the very middle of the growing point of the plant, where the new leaves are being formed but have not yet expanded.
- Heavily infested plants can become severely distorted, and infestation can rapidly spread through a crop from an initial focus.

## KEY TREATMENTS



### **Amblyline**

**Amblyline** contains the predatory mite, *Amblyseius cucumeris*. This species has a long history of effective use against thrips larvae; making it one of the most trusted tools for integrated pest management. It will target a wide range of thrips species, as well as contributing to control of broad mite and cyclamen mite. When targeting thrips, it will only feed on first instar larvae, meaning it is best suited to preventative programs. However, it is available in breeder sachets and it will also feed on pollen to help its establishment, which makes preventative programs easy to use!

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips, Broad Mite & Cyclamen Mite

**Target Life Stage** » 

**Delivery Systems** » Sachets, Tubes & Bags




## **Anderline**

**Anderline** contains the predatory mite, *Amblyseius andersoni*. This species feeds on a wide range of mites and small insects, as well as eating plant pollen. This varied diet makes it easy to establish high populations of *Andersoni*, which are perfect for preventive control of broad mites and other mite pests.

**Target Crops** » Vegetables, Ornamentals, Fruit trees & Berries

**Target Pest** » Broad Mite, Cyclamen Mite, Spider Mites (Including *Tetranychus urticae*, *Tetranychus cinnabarinus*, *Panonychus ulmi*) & Tomato Russet Mite.

**Target Life Stage** » 

**Delivery Systems** » Sachets, Bags & Tubes

## **Californiline**

**Californiline** contains the generalist predatory mite, *Amblyseius californicus*. This species persists longer in the crop than many other spider mite predators and is more resistant to high temperatures, low humidities and some commonly used insecticides. These characteristics make it a good choice for spider mite control in challenging environments.

**Target Crops** » Vegetables, Ornamentals, Fruit trees, Citrus & Berries

**Target Pest** » Broad Mite, Cyclamen Mite, Spider Mites (Including *Tetranychus urticae*, *Tetranychus cinnabarinus*)

**Target Life Stage** » 

**Delivery Systems** » Sachets, Bottles & Tubes







# LEPIDOPTERA CONTROL

- Larvae (caterpillars) of various species e.g. moths or butterflies are responsible for plant damage mainly because larvae feed on foliage. However, in some cases larvae burrow into developing fruit, or into plant stems or roots.
- Some species are very selective and will feed on only a single species or family of plants, whereas others are able to feed on a wide range of plant species.
- What do the effects of a larvae infestation look like? Well, in severe cases this feeding can lead to total defoliation or collapse of the plant. In less severe cases the crop yield will be reduced, or produce is made unmarketable by the presence of caterpillars in fruit. Other species cause post-harvest damage by feeding on stored products such as grains and dried fruits.
- Patterns of leaf damage are very variable, depending on the species and stage of the larvae, and whether they are solitary or gregarious feeders. Larvae which start out by feeding on leaves often leave droppings in the form of black pellets which identify the location of the caterpillar.
- Other, usually smaller, species protect themselves by rolling leaves or binding several leaves or petals together with silk. These are difficult to control, and can cause major aesthetic damage on ornamental plants.

## KEY TREATMENTS



### Tricholine

*Trichogramma* are small parasitic wasps. The females lay eggs in the eggs of lepidopteran pests, destroying them and preventing the emergence of caterpillars. **Tricholine Tuta** contains a strain of *Trichogramma* specially selected for its efficacy in parasitising *Tuta absoluta*. Bionline usually recommends using **Tricholine Tuta** in combination with **Macroline** at the start of cultivation, supplemented by regular releases throughout the crop cycle. Doses and retreat frequencies should be adapted to the specific circumstances, e.g. level of infestation.

**Target Crops** » Vegetables, &Ornamentals

**Target Pest** » *Tuta absoluta*

**Target Life Stage** » 

**Delivery Systems** » Cards

### Zentinel

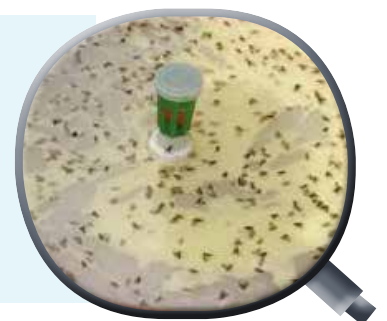
**Zentinel** is a pheromone diffuser used to monitor males of the South American Leafminer (*Tuta absoluta*). The pheromone acts a sexual attractant for males and improves trap catches.

**Target Pest** » *Tuta absoluta*

**Target Crops** » Vegetables (Tomatoes)

**Target Life Stage** » 

**Delivery Systems** » Diffusers





## Macroline

*Macrolophus pygmeus* (formerly *caliginosus*), a Mirid bug, is a highly mobile predator that is used to control a wide range of insect and mite pests. It is important to establish strong populations of *Macrolophus* before pest populations build up, therefore, regular releases should be made early in the crop cycle.

**Target Crops** » Vegetables

**Target Pest** » Whitefly, Lepidoptera & Spider Mites  
Spider Mites (including, *Tetranychus urticae*, *Tetranychus cinnabarius*, *Panonychus ulmi*).

**Target Life Stage** »  

**Delivery Systems** » Bottles



## Nesiline

**Nesiline** contains the predatory mirid bug, *Nesidiocoris tenuis*. It is a highly mobile predator of European origin for use in Mediterranean regions but not North America, whilst *Dicyphus hesperus* is of North American origin and is not available for use in Europe. Nesiline controls small insect pests, including whitefly and *Tuta absoluta*. It should be released early in the crop cycle to allow time for good establishment.

**Target Crops** » Vegetables

**Target Pest** » Whitefly & *Tuta absoluta*

**Target Life Stage** »  

**Delivery Systems** » Bottles



## Hesperusline

**Hesperusline** contains the generalist predatory bug *Dicyphus hesperus*, which is native to the west coast of North America. It was initially developed to control whitefly and other pests on North American tomato crops. All the mobile stages are predatory, and will feed on a range of insect pests including whitefly. It should be released early in the crop cycle to allow time for good establishment.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Whitefly, Thrips, Moth Eggs & Spider Mite

**Target Life Stage** »  

**Delivery Systems** » Bottles



## Podiline

**Podiline** contains the predatory bug *Podisus maculiventris*. This species is sometimes called the 'spined soldier bug'. It is a large and distinctive bug which is a generalist predator of larger, soft bodied pests. It's particularly good for controlling a wide range of Lepidopteran pests because it can kill caterpillars that are much larger than itself by injecting them with poison (only harmful to insects). This species is long lived, with each adult female surviving up to 3 months, but it can be slow to develop, so it should be released early in the crop cycle. Adults and nymphs are both predatory and will both contribute to controlling the pest, but the adults can fly which means they can move more freely to find pests throughout the greenhouse.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Lepidoptera

**Target Life Stage** »  

**Delivery Systems** » Blisters



# WHITEFLY CONTROL

## IS WHITEFLY WEAKENING YOUR CROP PRODUCTION?

- Whitefly can damage crops in several ways. The adults and larvae suck sap from the plant, directly weakening it. They excrete excess sugars from the sap as honeydew, which makes the leaves and fruit sticky and encourages the growth of sooty moulds which reduce photosynthesis and are unsightly. Adults can also transmit plant pathogenic viruses to the crop, which can cause distortion, yield loss or crop death.
- There are two main species of whitefly which affect commercial crops.
- The Greenhouse Whitefly (*Trialeurodes vaporariorum*) has adults which cluster towards the growing point of plants. Larvae are oval in shape and older larvae are visibly thickened.
- The Tobacco or Silverleaf Whitefly (*Bemisia tabaci*) has adults which will settle on older leaves, so all stages can be found on any part of the plant. The larvae are generally smaller than those of *T. vaporariorum*, are slightly pointed towards the rear end, and remain flattened throughout their lives.
- *Bemisia tabaci* has become the dominant species in the Canary Islands and Mediterranean regions, and is spreading northwards. It is recorded as a vector of 111 species of virus diseases of plants around the world. In tomatoes the principal virus is Tomato Yellow Leaf-Curl Virus (TYLCV), whilst in cucurbits there are several species with different symptoms, such as Cucumber Vein Yellowing Virus (CVYV) and Cucurbit Yellow Stunting Disorder Virus (CYSDV).

## KEY TREATMENTS



### **Montyline**

**Montyline** contains the predatory mite *Amblyseius (Typhlodromips) montdorensis*, which is a tropical/sub-tropical species. This predator eats many more thrips per day and lays twice as many eggs compared with either *A. cucumeris* or *A. swirskii*. It is also active at slightly lower temperatures than *A. swirskii*. **Montyline** is recommended for preventative use in crops that suffer from both thrips and whitefly. Growers using **Montyline** also benefit from supplementary spider mite suppression, as *Montdorensis* helps to suppress early infestations.

**Target Crops** » Vegetables, Ornamentals & Berries.

**Target Pest** » Whitefly, Thrips, Russet Mites & Broad Mites, Spider mites (Secondary target).

**Target Life Stage** »  

**Delivery Systems** » Sachets, Tubes & Bags.



## Swirskiline

**Swirskiline** contains the predatory mite, *Amblyseius swirskii*. It is used for whitefly and thrips control but it will provide some reduction in other small pests. Ideal for protected crops in warm conditions but it can be used on non-protected crops, provided average daytime temperatures exceed 68°F/20°C. Establishment will be fastest on crops with ample pollen, as the pollen provides an alternative food source. Crops without pollen will have slower establishment but can use sachets that will continuously release mites to improve results.

**Target Crops** » Vegetables, Ornamentals, Fruit trees, Citrus & Berries

**Target Pest** » Whitefly & Thrips

**Target Life Stage** »  

**Delivery Systems** » Sachets, Tubes & Bags



## Encarline

**Encarline** contains the hymenopterous parasitoid, *Encarsia formosa*. This species has become a fundamental component of biocontrol programs for Greenhouse Whitefly (*Trialeurodes vaporariorum*). The adult wasps parasitise third and fourth larval stages of whitefly, whilst also attacking younger larval stages for host feeding. The parasitoid has high emergence rates and is easy to detect in crop because the parasitised host larvae turn black. **Encarline** can be used with **Eretline** which target a wider range of whitefly species, making these two products highly complementary. They are also available as a mixed product **Encarline Mix**, containing both species.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Whitefly (*Trialeurodes vaporariorum*)

**Target Life Stage** » 

**Delivery Systems** » Cards & Vials



## Eretline

**Eretline** contains the parasitoid wasp, *Eretmocerus eremicus*. This species is a hymenopterous parasite of whitefly larvae, attacking the 2nd larval stage of *Trialeurodes vaporariorum* and *Bemisia tabaci*. Parasitism is easy to recognise by the yellow-brown colour of the host larvae. *Eretmocerus* originates from the desert regions of Arizona and California, and is able to tolerate higher temperatures than *Encarsia formosa*. **Eretline** can be used to target a wider range of whitefly species than **Encarline**, making these two products highly complementary. They are also available as a mixed product **Encarline Mix**, containing both species.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Whitefly Larvae (*Trialeurodes vaporariorum* & *Bemisia tabaci*)

**Target Life Stage** » 

**Delivery Systems** » Vials, Blister Packs & Cards



## Macroline

*Macrolophus pygmeus* (formerly *caliginosus*), a Mirid bug, is a highly mobile predator that is used to control a wide range of insect and mite pests. It is important to establish strong populations of *Macrolophus* before pest populations build up, therefore, regular release should be made early in the crop cycle.

**Target Crops** » Vegetables

**Target Pest** » Whitefly, Spider Mites & Lepidoptera

**Target Life Stage** » 

**Delivery Systems** » Bottles



## Nesiline

**Nesiline** contains the predatory mirid bug, *Nesidiocoris tenuis*. It is a highly mobile predator of European origin for use in Mediterranean regions but not North America, whilst *Dicyphus hesperus* is of North American origin and is not available for use in Europe. Nesiline controls small insect pests, including whitefly and *Tuta absoluta*. It should be released early in the crop cycle to allow time for good establishment.

**Target Crops** » Vegetables

**Target Pest** » Whitefly & *Tuta absoluta*

**Target Life Stage** »  

**Delivery Systems** » Bottles



## Trapline

Made from a combination of high impact polystyrene with high-tech, non-drying, adhesive glue – Bioline AgroScience's Trapline range is scientifically optimised to enhance attraction of a range of flying insect pests. Yellow traps are usually recommended for monitoring and control of whitefly.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Thrips, Whitefly, Aphid, Sciarid Flies and Leafminer.

**Target Life Stage** » 

**Delivery Systems** » Cards & Roller traps



## Hesperusline

**Hesperusline** Hesperusline contains the generalist predatory bug *Dicyphus hesperus*, which is native to the west coast of North America. It was initially developed to control whitefly and other pests on North American tomato crops. All the mobile stages are predatory, and will feed on a range of insect pests including whitefly. It should be released early in the crop cycle to allow time for good establishment.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Whitefly, Thrips, Moth Eggs & Spider Mite

**Target Life Stage** »  

**Delivery Systems** » Bottles



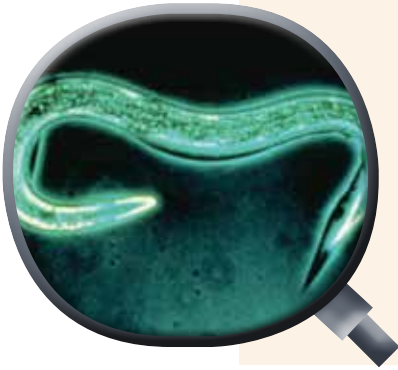


# VINE WEEVIL CONTROL

## IS VINE WEEVIL FEEDING ON YOUR CROPS?

- Vine Weevil or Black Vine Weevil are beetles that are a light grey-brownish colour with pale marks, around 1cm long.
- They cause a characteristic notch in the leaves of ornamental plants as the larvae feed on plant roots. The infestations can escalate quickly as adults lay eggs close to the roots of plants which hatch and begin to feed underground.
- The beetles are nocturnal, and hide during the day, so that damage is often apparent even when no beetles can be found. All adult beetles are female and flightless: males are unknown.

## KEY TREATMENTS



### Nemasys® L

**Nemasys L** contains *Steinernema kraussei*, a nematode species naturally endemic to the UK. This species has a real benefit in being more cold-tolerant than other predatory nematodes.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Black Vine Weevil

**Target Life Stage** » 

**Delivery Systems** » Powder or Gel



### Exhibitline Hb

### Exhibitline Sc

Exhibitline Hb and Exhibitline Sc features the pathogenic nematodes, *Heterorhabditis bacteriophora* and *Steinernema carpocapsae*. These nematodes are used for the control of *Otiorynchus sulcatus* (a.k.a Black Vine Weevil) larvae feeding on roots in the soil. These two species are known to actively hunt for their prey and can be used for curative treatments as well as providing four weeks of continuous protection.

Exhibitline is also available as mixed products (availability will vary depending on country):

- **Exhibitline LG** - a mix of Exhibitline Hb and Exhibitline Sc.
- **Exhibitline GH** - a mix of Exhibitline Sf and Exhibitline Sf.

**Target Crops** » Vegetables, Ornamentals & Soft Fruits

**Target Pest** » Black Vine Weevil

**Target Life Stage** » 

**Delivery Systems** » Trays & Bags



# VINE WEEVIL CONTROL

## CATCH THE EARLY SIGNS OF MEALY BUGS...

- Mealy bugs are insects which are covered with a white waxy powder. They feed in groups by puncturing the leaves and sucking out a meal of plant sap.
- They secrete honeydew that can lead to secondary disease infections such as sooty moulds. Males have a single pair of wings and fly to spread their populations.
- Mealy bugs feed on a variety of plants such as ornamentals, cut flowers, vines, citrus, tomatoes and peppers.

## KEY TREATMENTS



### **Cryptoline**

*Cryptolaemus montrouzieri* is a Coccinellid predator, which is used widely throughout Europe for the control of Mealy Bug pests in indoor ornamentals, citrus and other tree crops. Adults and juveniles of this species are both voracious predators.

**Target Crops** » Vegetables, Ornamentals & Citrus

**Target Pest** » Mealy Bug & Soft Scale

**Target Life Stage** » 

**Delivery Systems** » Vials & tubes



### **Anagline**

**Anagline** features the parasitic wasp, *Anagyrus pseudococci*, which is used in Europe to control the citrus mealy bug in indoor ornamentals. *Anagyrus* actively searches for mealy bugs, when it finds its prey it stings the mealy bug with its ovipositor to paralyze it. Then it injects an egg, which will develop inside the mealybug.

**Target Crops** » Ornamentals

**Target Pest** » Mealy bug

**Target Life Stage** » 

**Delivery Systems** » Bottles



# LEAFMINER CONTROL

## LIRIOMYZA SPP. & PHYTOMYZA SYNGENESIAE PREVENTION...

- Adult female leaf-miners produce characteristic feeding marks on leaves, and lay eggs into some of these. The solitary larvae of these flies feed within the leaf, leaving trails or 'mines' which grow rapidly in length and width. In serious cases the leaf area is reduced enough to affect crop yield, whilst in ornamental crops the damage is highly visible and results in loss of value.
- The adults of the four *Liriomyza spp.* are very difficult to distinguish from each other, being predominantly brown with a clear yellow spot on the thorax.
- The larvae of *L. trifolii* are uniformly yellow, whereas the other *Liriomyza* species are white with a yellow front end. When mature, the larva emerges from the leaf through a slit in the mine, and forms a puparium which is initially pale but which becomes dark brown.
- *Phytomyza syngenesiae* is a larger species which is predominantly grey, and lacks the yellow spot on the thorax. Larvae do not emerge from the leaf, but from the puparium within the mine made by the larva. This species mainly attacks plants in the family *Compositae*.

## KEY TREATMENTS



### Digline

*Diglyphus isaea* is an ectoparasitic wasp that lays its eggs next to paralyzed leafminer larvae. The eggs quickly hatch and begin to feed. The paralyzed leafminer larvae discolour, move away from the tip of the mine and become flaccid and unresponsive, before eventually dying. *Diglyphus* is known to establish quickly after release in the greenhouse, making it suitable for controlling growing populations of leafminers.

**Target Crops** » Vegetables & Ornamentals

**Target Pest** » Leafminers

**Target Life Stage** » 

**Delivery Systems** » Vials





# POLLINATION SERVICES

- Flowers need to be pollinated to maximize fruit quality and yield.
- Most tomato crops, indoor strawberries and soft fruit crops are pollinated using bumblebees because of the significant impact on yield and fruit set.
- Bumblebees require sugar for flight energy and feeding their colony. They require pollen as a protein source for reproduction.
- Since tomato flowers have little nectar, a supplement is required in the hive to maintain colony growth. The efficiency of a hive in a greenhouse depends on the successful growth of the bee colony. The ability of the bumblebee to collect and transfer pollen, and the pollen content of flowers, are affected by cultivation techniques.
- The amount of water given to the plants can affect the quality of the pollen and hence the development of the hive itself. Water stress and high temperatures cause bad pollen. If the plants are watered at the wrong time and temperature is increased, the flowers may become wet with dew and the pollen becomes “sticky”. Bumblebees will lose interest in sticky pollen. Adding new hives will not improve pollination. When an extra stem is allowed to develop, there will be a short period with a lot of flowers. If bumblebees can’t keep up with the extra flowers, it is advisable to put in some extra hives.

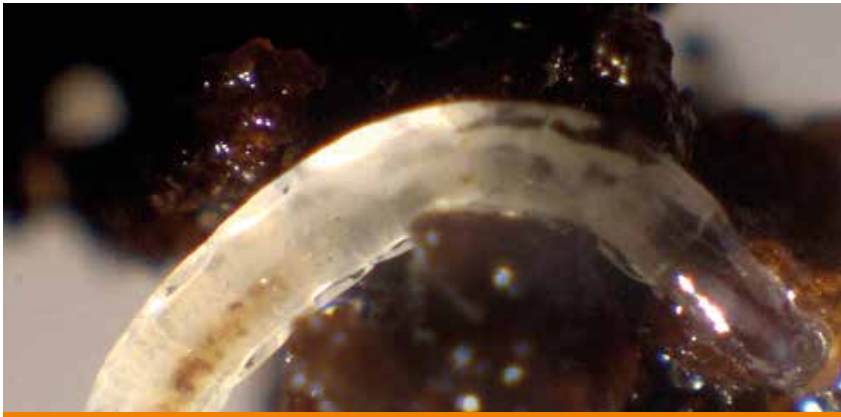


The design of the Beeline hives have been continuously improved based on field experience. With a self-feeding sugar system and a simple bee-lock for flight management, no maintenance is required. Hives are produced to suit different crops and situations.

**Target Crop(s)**» Vegetables, Soft Fruits & Top Fruits

**Target Pest** » Pollination

**Delivery Systems**» Multiple adaptations of hives



# SOIL PEST AND SCIARID CONTROL

## WHY YOU SHOULD MANAGE YOUR SOIL PESTS/SCIARIDS...

- There are two main soil pests which affect commercial crops (excluding Vine Weevil which is dealt with separately).
- Sciarid Flies or Fungus Gnats (*Bradysia paupera* and related species in the family Sciaridae) are very common pests, particularly of ornamental plants. The adult flies are small and mostly have nuisance value, but their larvae cause significant damage by feeding on small plant roots. They can also burrow up inside the stems of cuttings, killing the cutting. The larvae will also feed on fungi in the soil and those infecting plants, and the adult Fungus Gnats are known to act as vectors for some important plant diseases.
- Shore Flies (*Scatella spp*) also cause a major nuisance. The larvae feed on algae growing on the substrate surface in wet conditions, and don't cause direct damage to plants. The adult flies, however, decrease the aesthetic value of flowers and herbs by leaving faecal spots on petals, or becoming trapped in transparent packaging for herbs.

## KEY TREATMENTS



### Hypoline

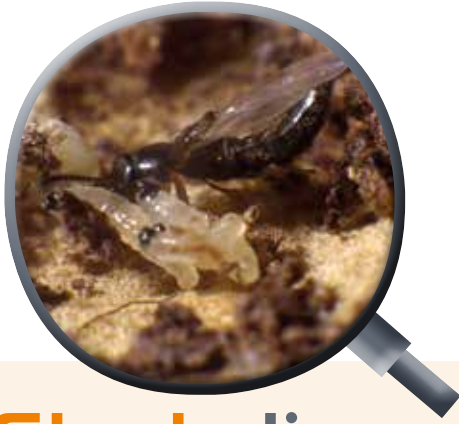
*Hypoaspis miles* (also known as *Stratiolaelaps scimitus*) is a soil dwelling predatory mite and is the biological control agent found in Bioline's **Hypoline** product. These mites aid in controlling fungus gnat larvae, Shorefly larvae and thrips pupae that drop from the plant into the growing media. This predator is usually found within the top half inch of soil or growing media.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Fungus gnats, Shoreflies & Thrips pupae

**Target Life Stage** » 

**Delivery Systems** » Tubes & Bags



## Staphyline

**Staphyline** contains *Atheta coriaria*, a Staphylinid beetle that is a predator of soil and compost pests. This rove beetle is a generalist arthropod feeder, but the adults and young stages are particularly good at feeding on the larvae of Sciarid flies and Shore flies. It should be introduced early in the growing season and, with careful management, good populations will build up to give high levels of control. The population build up will be faster if the Atheta breeder kit is used.

**Target Crops** » Vegetables, Ornamentals & Berries

**Target Pest** » Sciarid Flies, Shore Flies & Thrips pupae

**Target Life Stage** »  

**Delivery Systems** » Tubes, Tubs & Breeding kits



## Exhibitline Sf

**Exhibitline Sf** contains the insect pathogenic nematode *Steinernema feltiae*. The nematodes move through the water films around soil particles and actively seek out Sciarid fly larvae. Similarly, it is also used for the control of Western Flower Thrips and Leafminers on ornamental plants. **Exhibitline sf** can also be used as a pre-planting treatment for thrips in cut flowers such as chrysanthemums.

Also available as a mixed product (availability will vary depending on country):

**Exhibitline GH** - containing Exhibitline Sf and Exhibitline Sc

**Target Crops** » Vegetables, Ornamentals & Mushroom

**Target Pest** » *Bradysia sp*, Sciarid Fly larvae feeding in soil, Western Flower Thrips (WFT), Leafminers

**Target Life Stage** » 

**Delivery Systems** » Trays



# DISCOVER OUR DELIVERY SYSTEMS



## SACHETS

Sachets contain a breeding colony of mites that are constantly released on the plant, even before the target pest is present. How? The breeding colony is contained within a small paper sachet that is carefully designed to maintain the colony to a good quality. Mites continue to emerge from sachets over several weeks, and at a much higher rate than can be achieved with a single broadcast release.

We have a versatile portfolio of sachets available to protect a variety of crops from propagation to harvest.

### Controlled release system (CRS) sachets

CRS is our original sachet product. The large sachet provides the biological control agents with the perfect breeding environment.

### Mini sachets

This smaller type of sachet is ideal when the crop requires multiple introduction points of the predatory mite — especially where the leaves of plants are not expected to touch or grow together.

### Gemini sachets

Gemini is suitable for crops with overhead irrigation or where horizontal wire string is in place as the water-resistant design allows for maximum emergence of predatory mites. Water runs off the outer surface which keeps the exit hole protected

### Sachet on a stick

Propagation is one of the most critical times for pest management. Mini sachets on a stick are ideal for effective pest prevention and control at this time.

### Bugline

Bioline's bugline saves up to eight labour hours per acre because it can be mechanically layered onto the crop. It's unique design ensures maximum emergence of BCAs even under stressful conditions or where there is overhead irrigation.



## LOOSE MATERIAL

**Bulk bags, tubes, bottles & vials** provide an immediate high dose of predatory mites. This system is good for quickly establishing a population of mites and providing an immediate defense for your crop.

## CARDS & BLISTERS

### Cards

Supplied as parasitized scales attached to cards, which are hung in the crop where they hatch out and attack the target pest.

### Blister packs

Blister packs make product clearly visible and allow the grower to judge quality and emergence more easily. They also protect the parasite pupae without having to glue them down and are more robust. Blister packs increase emergence rates by up to 30%. When used with predatory mites and insects they also give a cleaner crop because no carrier material is applied directly to the crop.





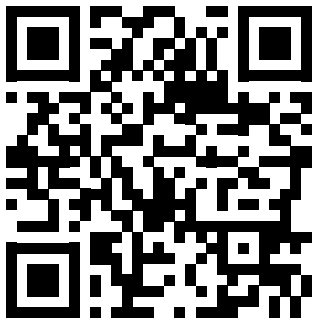
# Bioline

## AgroSciences

Cultivating **Bio**alliances



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