

# A Practical IPM Guide to Controlling Vine Weevil on Ornamental Nurseries

- Understanding the pest
- What to look for
- When to act
- What control options are available
- An example programme for control



# Introduction

Black Vine Weevil (*Otiorynchus sulcatus*) is one of the most serious pests seen on ornamental nurseries. As a native species it is endemic to the whole of the British Isles and can be commonly found in woodlands and hedgerows. As such it is a constant threat, especially in Hardy Nursery Stock (HNS), as adults can arrive on site from any number of sources, including brought in plants, and establish a population. Once on site numbers can build rapidly over a year or two, and if not kept in check can cause considerable damage. This practical guide is intended to give growers an overview of the options and tools they can use to deal with vine weevils before they become a problem.

## Tackling the problem

This guide is split into four sections.

### 1. The Pest

Firstly we need to understand a few fundamental things about vine weevil, its biology and behaviour. In this way we will be able to clearly identify the pest and know when and how it can be most efficiently controlled. In the first section of this guide we will look at this in detail.

### 2. Monitoring

The cornerstone of all good pest control is knowing when you have an issue and how severe it is. As vine weevil larvae are located within the growing media and adults are very rarely active during the day it is all too easy for a vine weevil infestation to develop without being noticed. In this section we will look at a robust plan for ensuring this does not occur.

### 3. Control options

Unfortunately there is no simple one stop solution to vine weevil control and it is likely that on most nurseries a combination of strategies and control products will have to be used. In this section we explore currently available control options and when best to use them.

### 4. An example programme

Putting together the information and advice from the previous sections we will present an example IPM programme for the control of vine weevil on a typical HNS nursery. This programme will not be suitable for all nurseries but will be a useful guide to designing your own strategy.

# The Pest

Vine weevil are difficult pests to control and one of the key reasons for this is that they can often be difficult to detect in a crop before they have already caused significant damage. Unlike many other insect pest species, adults are rarely seen feeding on the foliage in daylight and larvae are always concealed in the growing media. By understanding the pest's life cycle we are able to predict more accurately when we can target them with control measures.

## Adults

Vine weevil adults are 8.5 – 11.5mm long, predominantly black in colour but often with a mottled appearance to the abdomen caused by short tufts of dark yellow hair. They have an elongated head and prominent antennae. Adults are not swift runners and can be caught fairly easily if seen (like other weevils they have a tendency to play dead if disturbed), however they are almost exclusively active at night, spending daylight hours in dark refuges around the nursery such as under pots, pot rims or in trash and debris around beds. Adults seen during the day are often suffering from stress such as poor environmental conditions or lack of food.



All vine weevils are female and therefore numbers can grow extremely rapidly leading to high pest pressure. In her lifetime a vine weevil adult may lay up to 1000 eggs and so it is possible for a population to establish on a nursery even if very few individuals are introduced. Adults emerge from their pupal cases in May and June and spend their first few days in the growing media whilst their cuticles harden. Upon completion of this process they dig themselves out of the media and immediately seek out suitable sources of food. Adults feed on foliage cutting distinctive notches into the edges of leaves. It will

## What is IPM?

Integrated Pest Management (IPM) is a process by which we seek to manage potentially harmful pests and diseases using all the resources available. IPM Programmes start with good monitoring and preparation and can include traditional chemical controls, biological controls and also physical or environmental elements such as trapping of pests or adjusting greenhouse conditions to prevent disease spread. Although monitoring costs may be higher, this is often offset by lower treatment costs in the long run as preventative as well as curative measures are used.

**Use of IPM techniques has become law under EU regulations from January 2014.**

be several weeks before the newly emerged adult is capable of laying eggs and in this time she will seek out suitable feeding spots where she will subsequently lay her eggs.

Once she has fully matured the adult vine weevil will begin regularly laying eggs which she does in small groups in the growing media around the stems of plants that she is feeding on. Typically eggs are laid at a depth of 1 or 2cm, but in some circumstances they have been recorded much deeper than that. In high humidity environments eggs may be laid in trash and debris around plants or even in cracks and crevasses on the plants themselves, though this is generally only a very small percentage of eggs. Once the white eggs are laid in the media they quickly turn dark brown and are almost impossible to find.

## Other Weevil Species

Black Vine Weevil (*Otiorynchus sulcatus*) is the most commonly seen weevil pest of ornamental nurseries, but other species are sometimes seen. Clay Coloured Weevil (*Otiorynchus singularis*) is not uncommon and can be mistaken for Black Vine Weevil in some cases, though it is lighter in colour and generally slightly smaller. The information in this guide is specific to vine weevil so ensure that you identify your pest before taking action.

## Larvae

Vine weevil larvae are generally cream in colour though some individuals may appear slightly more pink or yellow. Their bodies are soft and legless, with a hard brown head capsule. Only 1mm or so long at hatching, larvae eventually reach up to 12mm in length before pupation.



It is the larval stage of vine weevil that causes serious plant damage, and they do so by attacking the roots and stem bases. Once they have hatched, vine weevil larvae move through the media feeding upon healthy root tissue. In some circumstances on hosts that have fleshy crowns or dense root mats, eggs are laid directly against plant tissue and the newly hatched larvae has an opportunity to burrow directly into some of the most sensitive areas of the plant. In these circumstances the larvae will have fairly little direct contact with the media, which can have important repercussions upon the effectiveness of compost incorporated control measures.

Older larvae have a preference for feeding on stem base tissue and can often cause serious damage or even kill plants outright by girdling them. In any case the damage done to root tissue, especially in the later season when plant growth is slowing or stopped, can be very difficult to detect. It is only when the plant attempts to grow on in the spring and collapses due to lack of root mass that the extent of the problem often becomes clear. Depending upon the crop, even small numbers of larvae can cause significant damage if given enough time.

Larvae overwinter around the roots of the plants, often deep in the media at the base of the pots. Once temperatures drop below 7°C the larvae, being exothermic, can no longer

continue to feed and will remain inactive over the winter in a state known as diapause. Larvae can survive in extremely low temperatures and so a harsh winter is no guarantee of control. Once temperatures begin to rise in the spring the larvae will resume feeding until it comes time to pupate into an adult, usually around April or May.

## Pupae

Pupae are at first bone white but will darken as the adult matures inside; they have the general shape of an adult with the legs folded closely across the body. Newly formed pupae will wriggle if moved. The pupal stage is relatively short lived, but depending on environmental conditions can be as long as a month.



## Life Cycle

Outdoors in the UK the life cycle of vine weevil, egg to adult, is typically 9 to 11 months. Under protection with plentiful food sources this cycle can be as short as 4 months, meaning there is the potential for 2 generations in a single year.



100



10,000

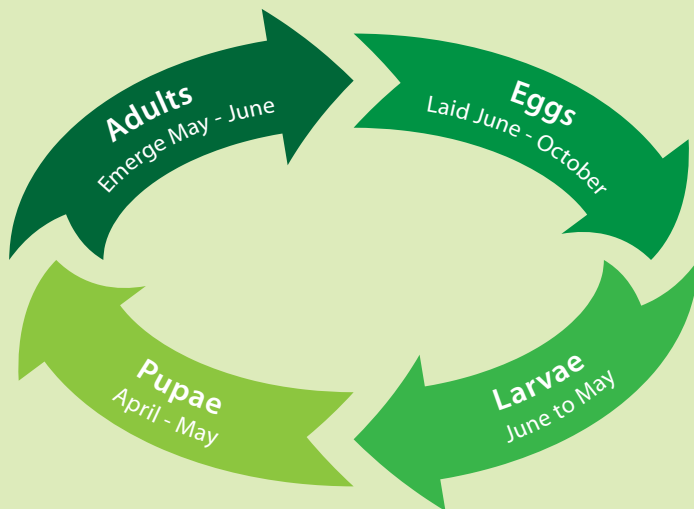


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Vine weevil numbers can increase extremely rapidly if left unchecked. Even assuming a survival rate of only 10%, 100 adults can in 2 years, increase to 1 million individuals. As such, control of adults before egg laying is an important part of an IPM programme.

## Life cycle of Black Vine Weevil outdoors in the UK

Some adults may overwinter from the previous year, especially under protection, and if so may be involved in early egg laying. In HNS, especially outdoors, this contribution is usually limited.



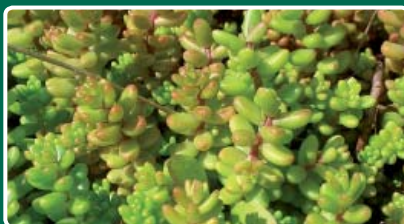
## Vulnerable Plant Species

Vine weevil will attack a wide range of ornamental and edible plants and can survive on almost any host. There are certain species that they favour though, and these can often be good indicator plants for the presence of the pest as damage is likely to be seen upon them first. It is not unusual to see vine weevil single out and attack specific beds on the nursery containing favoured plant varieties whilst ignoring less favoured subjects in close proximity.

Some varieties are not only more highly favoured by vine weevil, but are also more vulnerable to damage. This is either because the morphology of the plant itself renders it vulnerable, or because they are so favoured that vine weevil pressure is often unusually high on a plant by plant basis. Plants with fleshy crowns and dense root mats can sometimes shelter vine weevil larvae and make it difficult to control them either by compost incorporated treatment or chemical or nematode drenches.

Vulnerable and favoured species includes;

Heuchera	Taxus
Sedum	Rhododendron
Saxifrage	Viburnum
Euonymus	Prunus



# Monitoring

**Why?** Undoubtedly monitoring is the cornerstone of any successful control programme. It is essential to identify when, where and to what extent infestations are occurring in order that the correct control measures can be used.

## Monitoring for Adults

**When?** Adults should be monitored for from May onwards on a weekly basis.

The most straight forward way to monitor for the presence of adult vine weevil on the nursery is to look for the distinctive leaf notching they cause. This is more obvious on some subjects than others but it is always worth keeping a close eye on favoured plant varieties (see Vulnerable Plant Species).



As adult vine weevils are night feeders it is very rare to spot them moving around during daylight hours. It is possible to walk the nursery at night with a torch and see them but this is not a practical solution in most cases. Instead it is better to look for their daytime refuges which can often be found under pots, pot rims, loose Mypex, amongst debris, or in other dark hiding spots around beds. Adults are likely to shelter very close to their favoured feeding spots.



Another method is to provide refuges for them that can be easily checked. 6 inch squares of wood or dark plastic are ideal and can be placed in beds around vulnerable plants and checked daily by simply turning them over. Screwed up balls of newspaper can also be used. Place them around plants in the evening and pick them up the following morning to check for adult weevils.

Placing a few pots containing attractive and vulnerable species, such as Euonymus, around the nursery as monitoring plants is a common strategy, and one that can give an indication of where vine weevil may be coming from. Use as many of these 'trap' plants as is practical, 1 every 10 metres around beds would be ideal. Euonymus, particularly variegated varieties are useful, as not only is the leaf notching easy to see on them, but they often show a distinctive red or pink leaf tint when under stress caused by larvae feeding on the roots.

## Monitoring for Larvae

**When?** Larvae should be monitored for on outdoor crops from June onwards until the following spring. Monitor weekly.

Monitoring for larvae can only be done by knocking out pots and looking for them in the growing media. Very young larvae will likely be too small to detect, but larger ones are distinctive and simple to spot. Larvae can be anywhere in the pot, from just below the media surface right to the bottom of the pot. During periods of active feeding they can commonly be found around the crown of the plant. Often plants which are showing signs of stress can be a good indicator of the presence of larvae. If you see plants exhibiting stress symptoms these should be checked immediately.

In some cases it will not be possible to knock out pots, due to their size for example, and in these cases monitoring for adults may be the only available course of action.



## Control Options

In the UK growers have historically relied primarily upon persistent compost incorporated chemical products for the control of vine weevil in ornamental plant production. Unfortunately recent years have seen a dramatic decline in available pesticides and compost incorporated options in particular. It is extremely unlikely that we will be seeing the return of the sorts of broad spectrum, highly persistent products that were so effective in the past. As such it is now necessary to consider vine weevil control in terms of a broader IPM programme, potentially including several components that will together contribute towards control. It should be noted however that in some situations under certain circumstances, it will be almost impossible to completely eliminate the vine weevil threat.



Not all of these control options will be suitable for all sites and growing situations and it is up to the grower to decide upon the practicalities of each option. Making a plan early is essential as it may save significant time and effort later. For example laying out beds with a view to whether it may be necessary to apply drenches or foliar sprays to pots.



# Cultural Controls

The first step in cultural control is to ensure you start clean. In this way it is best practice to check any incoming stock for leaf notching by adults or larvae in the media. An untreated plug or liner may act as a refuge for larvae. Liner producers will be taking their own steps to control vine weevil so it is best to be aware of what these are and therefore what protection the product you are buying in already has. This can be essential in planning your own control programme.

## General Hygiene

- Debris, particularly leaf litter and plant waste, can be a safe haven for adults to hide in during the day. Keeping areas around beds clear is essential. Similarly broken pots, trays and so forth should be disposed of for the same reason.
- Extensive weed growth can provide good alternate feeding sites for vine weevil adults and should be controlled.
- Old compost can potentially be infested and should be disposed of well away from vulnerable plant species. Removing the media from the nursery is ideal.



## Crop Location

- Consider placing vulnerable species towards the centre of the nursery away from hedgerows and other points of invasion from the wider environment.
- Placing vulnerable species together will make monitoring and spray/drench treatments logistically easier.

## Physical Barriers

- Pot toppers are available in a variety of forms and are mainly sold for weed control. These can provide a physical barrier that reduces egg laying by adult vine weevil, but may also provide a refuge for adults in some circumstances.



# Biological Controls

There are no commercially available biological controls for adult vine weevils. Naturally occurring populations of ground beetles and small rodents such as shrews may predate upon adults to a certain extent but this is unlikely to make any significant contribution to overall control. Some growers have reported that chickens eat adult vine weevil but this is unlikely to be a practical solution in most cases. In any case most chemical sprays that are applied to control vine weevil adults will also have a negative effect on beneficial insects, so they are unlikely to occur in large numbers on most nurseries.

The two categories of biological controls currently available for control of vine weevil larvae are drench treatments of entomopathogenic nematodes (microscopic worms that attack insects), a principally curative option, and incorporation of entomopathogenic fungi (the product Met52), a principally preventative option.

## Entomopathogenic Nematodes



Microscopic nematode worms are a proven effective control for vine weevil larvae in the growing media. Several products are available containing different nematode species or combinations of species.

The most commonly used species are:

- *Steinernema kraussei* (Nemasys L) an efficient vine weevil killer that is active down to temperatures as low as 5°C. This makes it the ideal product to use on overwintered larvae in the early spring and late autumn.
- *Heterohabditis bacteriophora* (Exhibitline h) works at temperatures above 12°C. Turns larvae red as it kills them which can be a useful indication of treatment success.

Whichever product is used they share many advantages and the method of application is essentially the same.

## What can be expected of nematodes?

When used correctly nematodes can provide an excellent corrective treatment effect. Studies and experience have shown control levels in excess of 90% in many cases. Success however is based very much on correct timing and application.

## How nematodes work

Entomopathogenic nematodes are microscopic worms that use the bodies of insects as hosts for their reproductive process. Commercial products contain juvenile worms that when introduced to the media seek out hosts in the form of vine weevil larvae. Once they have located a host they enter it either through natural openings such as the mouth or spiracles (breathing holes) or via direct penetration of the insect cuticle. Once within the host the nematodes release symbiotic bacteria which kill the insect. The nematodes then use the dead body of the host to feed and produce the next generation.

## When nematodes should be used

Correct timing of use is essential as nematodes are generally only active in the media for 4-6 weeks.

- **Spring:** if overwintered larvae are found in the media an application of Nemasys L is recommended when temperatures rise above 5°C. April is the ideal month for this treatment.
- **Late Summer and Autumn:** By September the vast majority of eggs will have been laid in the average year and if larvae are present in the media a clean-up treatment with nematodes is recommended. If the autumn is especially mild or if the crop is under protection then a subsequent treatment in November should be considered to control any larvae that hatched late in the season.

## How nematodes should be applied

Application of nematodes can be made using standard spray equipment, via irrigation lines, or even by watering can in those situations where relatively small areas are to be treated. Nematodes are generally quite resistant to pressure and will not be harmed by the pressures regularly found in hydraulic spray equipment. However it is essential to follow manufacturers guidelines and these few general rules:

- Spray equipment must be cleaned thoroughly before use with nematodes. Chemical residues may be detrimental to them.
- Fine filters should be removed as these can create blockages when applying nematode products.
- If applying via irrigation lines ensure these are free of deposits that may cause blockages.
- Water temperature should be between 5 and 15°C.
- The water tank must be constantly agitated throughout the process as nematodes settle out very quickly at the rate of approximately 1cm/minute.
- It is standard to apply drench treatments at 10% of pot volume.  
For example, a 1 litre pot would require a drench of 100ml of diluted product.



## Entomopathogenic Fungi (Met52)



There is only one entomopathogenic fungus (a fungus that parasitises insects) available for the control of vine weevil larvae, Met52 Granular Bioinsecticide, a product which contains the fungus *Metarhizium anisopliae*. A registered product (MAPP 15168), Met52 has undergone the same approvals process as conventional chemical pesticides. It comes formulated on rice grains which are mixed through the media and subsequently break down leaving infective spores which have contact action against vine weevil larvae.

As a biological product Met52 has the advantage that it leaves no chemical residues, is fully IPM compatible and is a useful barrier to resistance.

### How is it used?

Met52 is a granular product for compost incorporation. It is used at a rate of 500g/m<sup>3</sup> of growing media and like other compost incorporated treatments can be mixed in by growing media suppliers prior to delivery to the customer.

### How does it work?

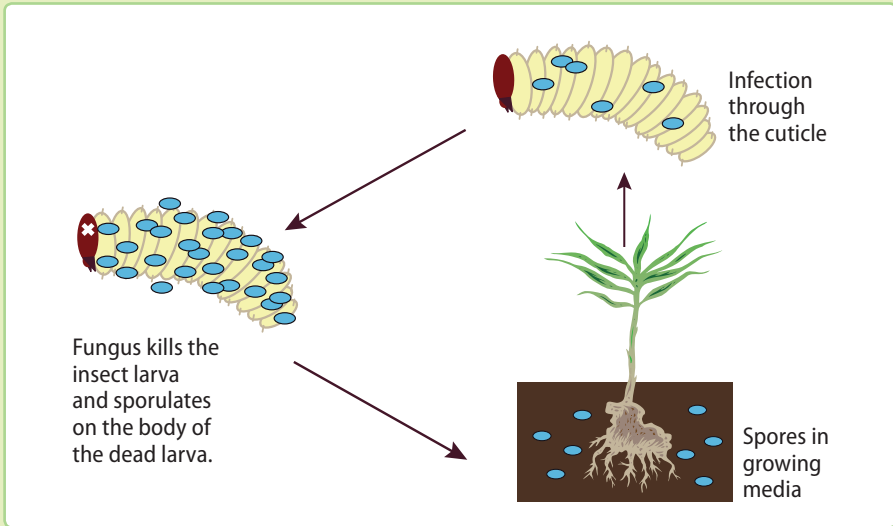
The active ingredient in Met52 is a fungus whose spores are distributed through the media when the granular product is mixed in. When vine weevil larvae hatch in treated media they come into contact with spores which germinate on their cuticles, growing inside them and killing them from within.

### When should it be used and how long does it last?

Met52 is recommended for application throughout the year, but efficacy from an Autumn potting may not be as high as from a Spring potting.

Efficacy shortly after application is typically in excess of 80% control. Efficacy declines with time and will be affected by local environmental conditions. Activity can be expected for a year and possibly more after application in favourable conditions.

## Metarhizium anisopliae - Simplified life cycle



### What are the environmental constraints?

Like all biological products Met52 is affected by environmental conditions. The chief thing to be aware of is that Met52 works more slowly as temperatures decline. It is likely to work slowly below 15°C and not at all below 10°C.

As discussed earlier, vine weevil larvae can remain active and feeding down to 7°C meaning there is a clear gap between the temperature at which the product stops working and the pest stops feeding. It is therefore imperative to monitor crops especially closely during cooler periods and in the autumn before temperatures fall too low for chemical and nematode drench treatments to be effective.

Although infection will not proceed at these lower temperatures, activity does resume again as temperatures rise. Larvae that are infected in the autumn will therefore only be killed as temperatures rise in the spring and this can be too late to prevent plant damage.

Spring potting is the ideal time for use and will see the most value from the product. See example programme.

### Can Met52 be applied as a mulch?

Yes, though this use is under EAMU (No. 1997 of 2011), so at the growers own risk. It is a useful option for adding some protection to large pots where drench treatments may be difficult. A mulch depth of 5cm is recommended, see EAMU for restrictions of use.

## Are there other things to keep in mind whilst using Met52?

As with all compost incorporated products it is essential to ensure that Met52 is mixed in thoroughly throughout the media. As a contact acting product it is important to note that untreated areas of the media may provide a safe haven for vine weevil larvae. This is especially important to keep in mind when buying in liners or potting on plants. If the inner core around the crown of the plant is essentially untreated, either through never having been treated or due to the age of the media and the subsequent decline in efficacy of the incorporated product, then serious infestations may be given an opportunity to develop.

## Is Met52 a standalone solution to vine weevil?

No, there are no standalone solutions to vine weevil available to UK growers. As with other compost incorporated products (discussed later), Met52 is an important component within an IPM programme but will not alone provide complete control under all conditions.

## Chemical Controls

Chemical control of vine weevil can be split into two broad categories, control of adults via foliar sprays and controls of larvae using compost incorporated and drench treatments.

### Chemical control of adults

Spray treatments against adult vine weevil are commonly used on the continent but have not been routinely relied upon in the UK for some decades. The main reason for this is that there has for some time been a range of highly effective and persistent compost incorporated chemical options. Now that these options have been severely restricted or withdrawn it makes sense to look again at adult sprays as an effective method for reducing the number of eggs laid in the crop.



### Timing of adult sprays

The normal window for application of adult sprays is between June and October when adults are actively feeding and laying eggs. In rare cases when a significant number of adults have overwintered, or under protection where the life cycle may be faster, it may be necessary to consider an adult spray in April or May. It is extremely unlikely that a single application of adult controls will be sufficient for the entire season; monitoring will inform this decision.

Adult sprays need to be applied to plants in the early evening (preferably on warm and damp days) when adults are becoming active and the crop can remain wet after dark. Spray application earlier in the day may not be so effective and should be avoided.

## Safety to non-target organisms

The two products listed in Table 1 are generally considered to be of low toxicity to most non-target organisms and are unlikely to have any major negative effect on beneficials such as predatory ground beetles. Broad spectrum products which are in use for vine weevil adult control, such as Hallmark (lambda-cyhalothrin) but which studies have shown to be unreliable as control measures (HDC-funded project SF HNS 112 #), are likely to be seriously detrimental to beneficials and are not recommended.

**Table 1: Adult chemical spray treatments shown to be effective in HDC report SF HNS 112**

Product	PCS No.:	Active Ingredient	Approval	Expectations
Chess WG	03365	pymetrozine	on-label tested at higher EAMU rate	In HDC trials achieved 60% control of adults after 15 days
Steward	02603	indoxacarb	Protected: on-label Outdoor: under EAMU	In HDC trials achieved 70% control of adults after 8 days at the outdoor use rate

## Chemical control of larvae: Compost incorporated treatments

Compost incorporated chemical treatments were up until recently the most important measure for control of vine weevil on UK nurseries. Unfortunately recent years have seen a major reduction in available products, and those that remain do not provide the levels of sustained and reliable long term control that growers have been used to. Table 2 summarises currently available products. Information correct at time of writing, growers should assure themselves of the legality of any chemical application before it is made.

**Table 2: Currently available compost incorporated products**

Product	PCS No.	Active Ingredient	Approval	Details
Imidasect 5GR*	04676	imidacloprid	on-label	Provides control for up to 12 months
Intercept 5GR*	01389	imidacloprid	on-label	Manufacturer withdrawing product. Last sales Summer 2014.

\* These products are currently restricted use only under protection. Contact Fargro for details.  
# for full project report go to [www.hdc.org.uk](http://www.hdc.org.uk)

As with use of the biological incorporated product Met52 it is essential that these products are thoroughly incorporated through the media and are used at every stage of growth from plug to final pot.

## Chemical control of larvae: Drench treatments

Whether compost incorporated treatments have been added to the growing media or not there will be situations where vine weevil larvae are seen in the media and a further treatment must be applied. In these cases the choice must be made between a biological solution, entomopathogenic nematodes, or a chemical solution in the form of a liquid drench. Liquid chemical drench options are not extensive and are summarised in Table 3.

### Table 3: Currently available chemical drench products

**Currently there are no chemical products (registered by PCS) recommended as drenches.**

\* *These products are currently restricted use only under protection. Contact Fargo for details.*

# *chlorpyrifos can be phytotoxic on some ornamentals.*

The chlorpyrifos based products are only usable at growers risk under the long term arrangements for extension of use. Information correct at time of writing, growers should assure themselves of the legality of any chemical application before it is made.

## Neonicotinoid Insecticides

Neonicotinoid based products have been associated in some quarters with damage to bees. As such there are currently EU wide restrictions on their use. Several products in this section contain imidacloprid whose use is currently restricted to greenhouses. Plants grown in media treated with imidacloprid may not be put outside until after they have finished flowering. In order to comply with EU law it is essential that you review the latest requirements before use of any Neonicotinoid containing products. Contact Fargo for the latest information.



# An Example Programme

Now that we have reviewed the options available for control of vine weevil it is time to put it all together with an example of a control programme that might be used on an outdoor hardy nursery stock nursery that sees fairly high pressure from vine weevil.

The example programme below will not be suitable for all nurseries, and in no way should this be seen as a guide to what is necessary on your nursery. Instead it is an example of what such a programme might look like in general.

Consult your advisor or Fargro for further advice.

## January - February:

- Clean up any debris from last season and ensure that growing media in particular that may have been infested with vine weevil is promptly disposed of.
- Knock out pots across the nursery and look for overwintering vine weevil larvae.
- If re-potting has begun look at using compost incorporated products. When potting this early in the season Met52 will provide the most long term solution.

## March - April:

- If vine weevil have been discovered in any of the pots then apply a remedial treatment with Nemasys L (*Steinernema krausseii*). Temperatures above 5°C will be necessary for this treatment.
- Incorporate Met52 during potting.

## May - June:

- Overwintered vine weevil adults and newly emerged adults will be feeding by this time. Look for the distinctive leaf notching and begin monitoring for adults in areas around vulnerable plant species.
- If adults are found then an early season treatment with an adult spray is advised. Repeat as necessary.
- Incorporate Met52 during potting.

## July - September:

- Continue monitoring for adults. If seen in numbers then apply a further adult spray treatment. Try to rotate products if possible.
- Start monitoring for larvae in the pots. Knock out pots at random weekly and look for larvae in the media. If in Met52 treated media monitor the larvae for infection.

- If larvae are seen in September consider a drench treatment before temperatures fall too low.
- Incorporate Met52 during potting (Efficacy from an Autumn potting may not be as high as from a Spring potting).

## **October:**

- Temperatures will soon be too cold for effective use of nematode drenches and adults are likely to become less active. As such it is essential that if you find any activity from adults or larvae at this point a final drench or spray is made to ensure you go into the winter clean.
- Incorporate Met52 during potting. (Efficacy from an Autumn potting may not be as high as from a Spring potting).

## **November - December:**

- Incorporate Met52 if potting on.

# **Designing your own programme**

When designing your own programme it is useful to keep these questions in mind.

## **1. How bad is vine weevil likely to be?**

Does the nursery regularly face issues, how heavy have infestations been in the past? If pressures are likely to be heavy then you will need to draw up a control programme that includes control of both adults and larvae.

## **2. Should I use compost incorporated products?**

In most cases the answer is likely to be yes, as only with a range of control measures will high levels of control be achieved. However in some lines, short lived bedding products for example that may be on the nursery for perhaps 3 or 4 months, it may be more efficient to control via other methods.

## **3. How do I implement a monitoring regime?**

As has been discussed monitoring is the cornerstone of IPM and must be constant and consistent. It may be prudent to give this responsibility to a single individual who monitors on a weekly basis and keeps written records.

## **4. When to take action?**

In most cases it will be necessary to take action as soon as monitoring reveals the presence of vine weevil. Do not give the pest time to build up on site.

## 5. Monitoring is costly, can I schedule control measures at the beginning of the year?

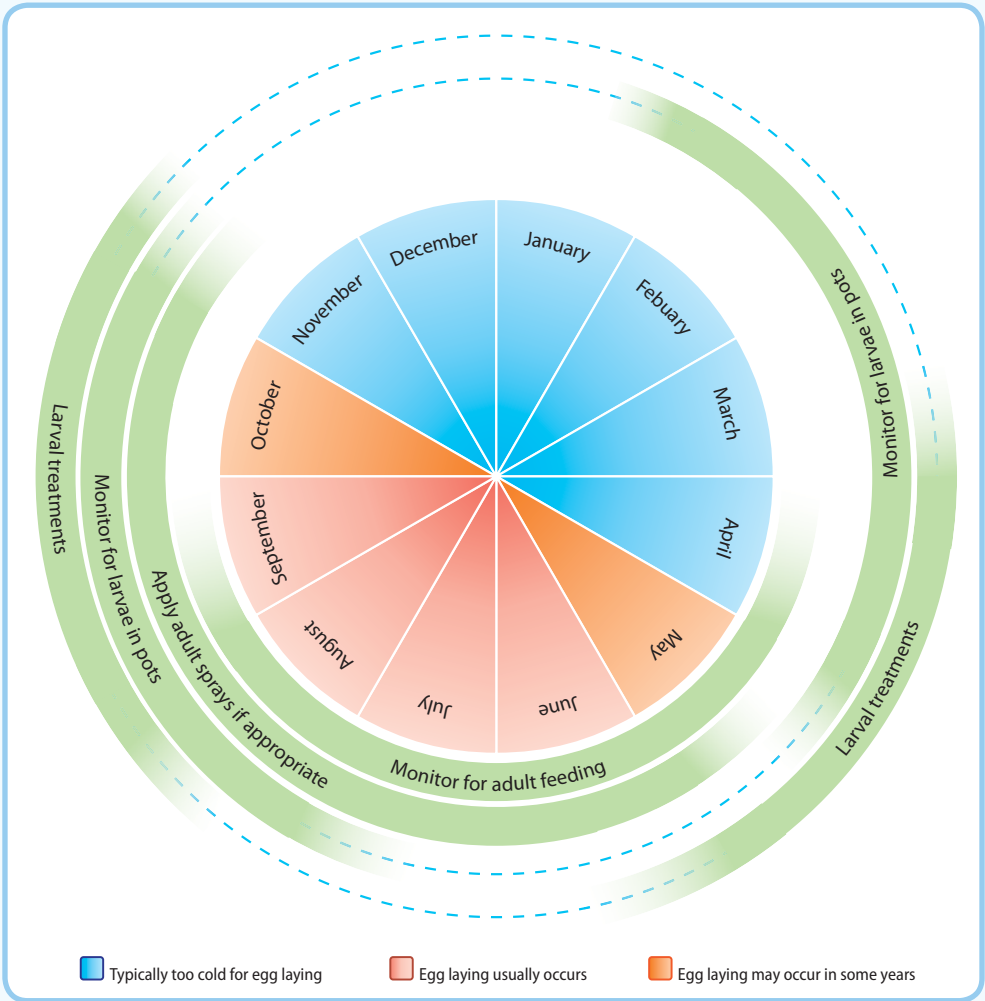
It is essential that control decisions are made based on monitoring. Scheduling a larval drench in September is all well and good in a standard year, but warm autumns may see later egg laying that is missed by a pre-scheduled treatment. In the long run it will be better to plan the drench but to only carry it out when monitoring of vine weevil activity indicates it will be most effective.

## 6. What are the practicalities?

In some cases it will not be practical to use certain control techniques on certain nurseries. Controlling larvae in pots over 10 litres in size via a drench can be difficult. Ensuring that all the media is treated may simply not be possible. In a case like this it would be prudent to concentrate chiefly on adult sprays as the primary control measure, with larval drenches as support to that programme.



The timetable below highlights the key decision points in this programme:



If you would like further advice about tailoring an IPM programme to suit your needs, or you would like to discuss any aspect of this guide then please contact NAD's Technical Team on **01-8437808**



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 T: (01) 8437808 F: (01) 8437909  
 E: sales@nadirl.com W: www.nad.ie



Met52® is a granular product containing 2% w/w *Metarhizium anisopliae* var. *anisopliae* strain F52 (a minimum of  $9 \times 10^{11}$  cfu/kg).

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