

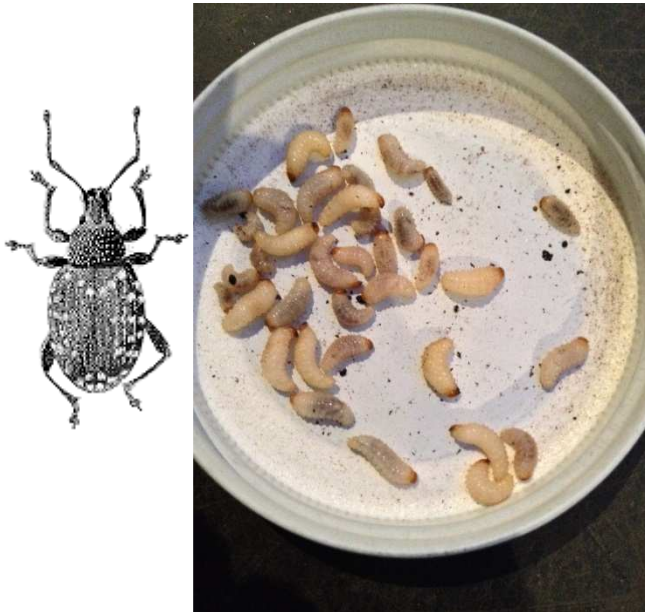
## Dealing with Vine Weevil

## Part one

**“By the pricking of my thumbs, something weevil this way comes” with apologies to Shakespeare**

### **The Vine Weevil and larvae**

The larvae in the photograph below came from 1 cubic foot of soil in a raised nursery primula bed of beautiful candelabra seedlings I had brought on. I had to dig out the entire 4ftx4ft bed and extract wash and treat forty plants in April.



This insect appears near the top of every list of annoying insects. It is very destructive and immediate action should be taken if you come across it. The adult weevil does not do terminal damage to a plant, since while it may make notches in the leaves, most plants can shrug it off. However the damage is done by the hundreds of larvae that grow from their eggs. These larvae live on a diet of plant roots and with a bad infestation they can chew until your plant is severed at the ground. They also cause such root trauma that when the plant explodes into growth in spring, it dies, as it cannot take in the necessary water to support the leaves.

This article is divided into sections for easy reference:

1. Plants at greater risk
2. The warning signs that they may be present
3. The insect and its stages
4. Chemical control
5. Biological control

### **Plants at greater risk**

Among the many plants that are at risk are vines, rhododendron and azaleas, bergenias, heucheras, primula, cyclamen, heathers, pines and taxus, strawberries and other rosaceae (though I have only come across them on the fruit side) and sedums. This list is not exhaustive, and some get

infestations of the weevil, and some of the weevil and grubs. I have been told the larvae can girdle the bark of young acers, azalea and rhododendron and kill those plants that way as well.

The weevil has to walk everywhere, since it has a sealed case and cannot fly, but it has hooked feet and can walk up walls and across ceilings, and commonly gets around by hitching a lift to your garden from a plant you buy in a garden centre or nursery.

Therefore any plant you bring into your garden is worth checking, particularly if it is a plant they like. I dose all incoming plants with larvae killer. Another hygiene exercise is to put a new bush in a bucket of water for fifteen minutes. It won't kill the larvae or the eggs, but the adult weevil will often come up to the surface or even to the top of the plant. Generally though, apart from killing them on sight you should stop worrying about the adults. There is nothing you can really do about them that is worth the effort.

### **The warning signs that adults may be present**

The adult weevil eats notches into leaves, or eats the tips of needles, in a wide range of plants. They may feed on one set of plants and lay their eggs on the surface of soil for another set of plants. For example it is unusual to come across an adult on primula, but common to find the larvae under the soil if adults are near-by. You can also have a large azalea or rhododendron that is too tough and well matured to be killed by the grubs, but which act as a host for the adults to wander off to lay their eggs on nearby smaller plants of similar type.



- Be vigilant. When you see this type of damage you should sit up.
- It would be like finding a Cherokee arrow beside a trail for a cowboy, it means something and you should take precautions.
- One adult means two hundred larvae.
- With mild winters more adults survive into the next year, and the larvae start munching earlier.
- Adults get a season, or maybe a season and a half.
- Larvae mainly grow through to autumn, settle down over the winter, and start serious damage from February/March.

Foliar feeding for adults takes place at night, though they will also venture out on heavily overcast days. If you disturb it on a plant the adult drops to the soil, typically upside down, and plays dead. Being black it is difficult to see them against the ground, and what chance do you have of finding them while wandering around your flower beds at night?

Concentrate on breaking the cycle by killing the larvae.

### **The warning signs that the larvae may be present**

Look for weak or discoloured leaves on young plants where plants are not thriving. Look for plants that remain wilted even when the soil is moist, as what is happening here is leaves are transpiring more water than the root system can replace, since the roots are being destroyed by the larvae. They may also girdle the main stem under or just above the surface.

The larvae are voracious feeders, with small grubs maybe 12 inches underground, and more mature larvae closer to the soil surface. The reason for this seems to be that bigger grubs have bigger appetites and move closer as they mature to nip into larger roots near the surface. As they do this they cut off major roots just below the soil, leading to complete destruction of the root systems. Clearly if they cut the roots at the top, everything below dies.

Often this damage is greatest in spring before plants start into their new growth. What happens then is that the plant attempts to grow leaves and blooms, but does not have the roots to deal with the water requirements through transpiration. You notice the plant wilting and water it, but it is a root problem, not a water problem, and unless you lift the plant cut back all the foliage, clean out all the pests and put it in a recovery phase to grow more roots it will probably die.

In the first photograph of a candelabra primula, below, the root system looks ok. However when you see the larvae you know you are in trouble. When you wash it down the roots disintegrate. When this plant tries to put on leaf growth it is trying to grow new roots, push out big leaves, and keep those leaves with sufficient water. Unsurprisingly the leaves wilt, you water it, and the plant dies.



### **The insect and its stages**

The adult is a hard shelled weevil about half an inch long as an adult, black with yellow spots. Every adult is female so if you do not kill them on sight you are guaranteed to be fostering hundreds of larvae. Each weevil lays between 200 and 1,000 eggs. These hatch into larvae, and go through a number of stages underground, called instars, before emerging as a fully developed adult 16 to 30 weeks later.

In the photographs below you see one hiding in a dahlia along with the ubiquitous earwig, and another in the side of a pot in a typical chamber they make, which then calmly walks away. (It didn't get far).



The larvae are white with a brown head and pincers, usually appearing as a C shaped grub. However they do move by undulation, pulling themselves forward with the mandibles. I have also observed them nipping other larvae around them to get them out of the way, and I am guessing they are establishing a pecking order as they seem to square up before one moves away. In the earlier instars they are legless, but as they get near to pupating they generate their legs and the larvae take on the characteristic three part insect appearance (head, thorax, abdomen) though they are still white or pinkish/yellowish with a brown head. They can live for days sitting in a jam jar until they dry out.

The smaller grub is deepest in the soil, feeding on finer roots. The larvae increase in size through six or seven stages where they moult they migrate nearer to the surface and up to the biggest roots as their appetite and mouth size increases. The larvae mature depending on temperature and availability of food, from about 75 days in one season to maybe 225 days if they have to overwinter and settle down for the cold months in underground chambers. Larvae can survive being frozen, I have read.

Pupation takes about 21 to 24 days. A few days after emerging they turn brown from white, then black. The adults emerge in spring or early summer, earlier in greenhouses from overwintered

larvae. The adult then engages in maturation feeding while developing its ovaries, and the speed of the development seems to depend on heat and quality of food source, from 20 to c. 50 days. Eggs are laid at night into crevices on the plant where the adult is feeding, dropped to the ground, or in the hiding place of the adult during the day. Eggs are small, and the round brown balls you find with acid plants are usually slow release fertilizer rather than vine weevil eggs.

The insect hides among the debris on the ground, down the sides of pots, in the flowers where there are multi petals, and sometimes just under the surface of the soil. They feed most heavily as they mature, and eat less when they move into the egg laying phase. Adults generally live about 90 to 100 days.

### Chemical control

There are few products available to the hobby gardener, and those that are available seem to cost more than Napoleon brandy.



Even some of the best insecticides for the professional growers have been delisted so this pest is on the up curve at present. The suggestion is that you buy the product, and use it to soak pots that may have the larvae. The only problem you have is that 750ml of chemical is used for soaking 150 litres of soil in pots, but if you pour that mix into the pots, they absorb it and it does less than half of what you expect. In my experience it costs about 25cent to treat an 8 inch pot. Fine if you have ten pots, not so good if you have 100.

In the photo I have just taken the plants from the pots, removed all the soil, and now I am washing the roots. This is drastic and frankly sets the plants back about three weeks, but it works as a step in a systematic approach.

The other chemical problem is that the weevils are as tough as all hell, and when you does with something that kills them, you have killed everything else on the same insect spectrum including any predators they may have. Strangely through the law of unintended consequences, the active ingredient in some slug pellets, methiocarb, also knocks off some of the weevil killers, the Carabid beetle for example ( just think regular beetles).

An example of the insect dynamics can be seen if I quote Richard S.Cowles of the Connecticut Agricultural Experiment Station. "In one field-grown yew nursery, where insecticides had been intensively used, I found (in a pitfall trap survey), approximately 1,500 black vine weevils and 200 predatory ground beetles. At the same time, in an unsprayed nursery, and with the same trapping effort, I recovered three black vine weevil adults and 950 predators." The suggestion here is that if you blanket bomb the weevil you kill off the predators, and the consequence is that you may get exclusively weevils.

Having said that I don't treat mature plants against the adult weevil. Anything that I spray or use that may kill the adult weevil, will probably kill me. I kill them by hand when I see them. The war is against the larvae.

Where I see the problem arising I dig out the plants that are at risk, wash off all the soil, trim back the leaves and replant in fresh compost after I have soaked the roots in the chemical to make them sour. A by-product of this is that the old leaves left often die back after about four weeks, but the new leaves are good and the roots grow strongly.

### **Biological control**

Another effective method for controlling black vine weevils in container-grown nursery stock includes the use of entomopathogenic nematodes (Cowles et al. 1997, Gill et al. 2001). These nematodes, or roundworms, are almost microscopic pathogens of insects. They search through moist soil for susceptible insects, enter into their body cavity, and release symbiotic bacteria, which quickly multiply and kill the host. Two or three generations later, the infective juvenile stage of nematodes emerges from the bacterial-soup remnants of the dead insect, to seek out new hosts.

Therefore, because they propagate in hosts, application of nematodes may lead to improved control of root weevil larvae over time. Mr. Cowles studies indicate that black vine weevil larvae are susceptible to virtually any commercially available species, including *Steinernema carpocapsae*, *S. feltiae*, and *Heterorhabditis bacterio-phora* (Cowles 1997).

You can buy these live nematodes in a sealed packet, about the size of the old cigarette packets, mix a slice off the mix with a gallon of water. The nematode infused material is like cotton wool and it does not mix very well in water. I also don't know whether using normal tap water, which is chemically treated to be fit to drink, may also kill the nematodes. I pour water into the watering can and let it reach room temperature over a day before I use it. That should let some of the chemical content burn off. You can see one variety of the nematodes below.



- Use when ground temperature is above , say , 7c
- Use on moist soil so water the pots or ground a couple of days ahead.
- Keep the pots or ground moist for a couple of weeks to extend nematode cycle.
- Easy and recommended, wear rubber gloves

Then you just dose the pots, or what I think I will do next time, is soak the pots in a tray so that the overflow can be recycled. It is also a good idea to probably water the pots well a couple of days earlier so that the soil is already moist. The little nematode worms seem to need a moist environment to swim around. The pots and soil also needs to stay moist for a couple of weeks.

The nematodes need about 7c as a base temperature, so they are best applied between, say March and November. The vine weevil larvae seem able to keep mobile and growing at temperatures below that.

The particular nematodes used for this purpose are in the genera *Steinernema* with control of vine weevil relying on bacteria carried in the eelworm's digestive system. On contact with weevil larvae, the nematodes enter through orifices or directly through the cuticle, and their cargo of bacteria is released. The bacteria cause septicaemia and the internal breakdown of weevil larvae tissues, which is then consumed as a "soup" by the nematodes. They are thus parasites and can survive only by infecting larvae. It strikes me that you need to be very careful with your handling of soils that have been dosed with this nematode, and wear gloves, I know I do.

I did a treatment in April, and will probably do another in August, and then again maybe in October. Bear in mind that if you do not find larvae, then they have moved on as adults. There is no point spending your money and dosing your pots and beds when the larvae have graduated. You have to wait for the next generation to appear.

They are top of my hit list after what they did to my primula. However have a look at Part two to see how you can turn their predations into an opportunity to grow more plants.

**End of part one.**

**Peter E. Lynch**