

# NURSERY PAPERS

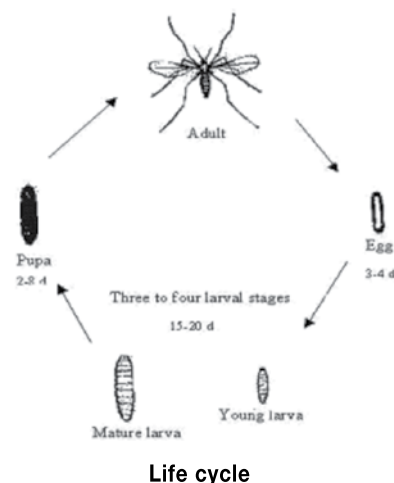
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## A pest concern for Production Nurseries that reinforces the need for IPM in your business

Over the past few years many new varieties of plant species have been developed and sold widely within the nursery industry of Australia.

Subsequently, as plant stocks increase within production nurseries and variations in local climatic conditions have their effect on insects and pests in and around crops, different issues are raised regarding identification and treatment of unusual pest problems that generally do not require treatment!

In this months Nursery Paper NGISA IDO Grant Dalwood looks at the impacts of Midge Flies on the nursery industry and suitable methods for their control.



### Midge Fly Background

A member of a family of small plant-feeding flies Cecidomyiidae that cause swellings or distortions of plant tissue, called galls. They are also known as *gall gnats* or *gall flies*, with *midgies* or sand flies also commonly used names. Worldwide there are 3000+ species with over 1,200 types found in North America alone.

Adult gall midges are tiny flies that look like small mosquitoes. They are typically about 3 mm long and have long, slender antennae and one pair of mostly-clear wings. The females of most species have a long, flexible egg-laying organ called an ovipositor for inserting eggs singly or in batches into narrow places such as crevices in developing buds. Some species have a stiff ovipositor for puncturing tissue and they insert their eggs directly into plants.

The tiny eggs when laid are colourless but darken as they mature and become yellow, orange, or reddish before hatching. The larva is legless, flat to cylindrical, and tapered at both ends. It may be white, yellow, orange, or red, depending on the species and age.

The larva use their jaw-like mouthparts to abrade or chew plant tissue. It is this feeding, and the insect's secretions that cause plant tissue to grow around the larva. This growth results in the formation of galls on leaves, flower heads, or stems.



Picture of Pupae of Gall Midge Fly in a Dianella species

The Gall Midge 'Cecidomyiids' is not listed on the Notifiable Pests list and as such often goes under the radar with regard to recognition.

Gall Midges have complete metamorphosis. The larva develop through three growth stages over 15-20 days, each separated by a moulting of the skin. The larva then either pupates within the gall or exits the plant, dropping to the ground and digging into soil to pupate. This causes a slightly different set of problems for production nurseries in order to control the insect's lifecycle. The oblong pupae are commonly coloured the same as mature larvae but can also appear darker. Both pupae and mature larvae of most species are 4 mm or less.

Development time from egg to adult varies depending on the species and location. Some species have several generations each year, while others can take two or three years to complete one generation.

Cecidomyiidae are also known for the strange phenomenon of paedogenesis in which the larval stage reproduces without first maturing itself. This is another cause for concern when chemical treatment is attempted during cooler periods. In some species the daughter larvae can actually consume the incubating mother. In others, reproduction can even occur within the egg or pupa.

Larvae of a few species feed on fungi or decaying organic matter and subsequently high standards of nursery hygiene are recommended to reduce the incidence of the insect developing further.

Adult Midge Flies are nocturnal and they are easily attracted using light traps located around stock. This provides another opportunity for control, albeit a difficult and expensive method. The use of correctly installed sticky fly traps is essential as a control measure during this stage of the fly's life cycle.



One species *Aphidoletes aphidomyza* (Aphid Midge Fly) is an important component of biological control programs for greenhouse crops and is widely sold in the USA.

Many Midge Flies are economically significant, the Hessian fly is an important insect pest of wheat, the galls causing severe damage to the crop. Rice is another widely distributed crop that can be severely affected by species of the fly. Serious damage to rice is limited to germinating seeds and very young seedlings in water seeded rice. Larvae feed by chewing on the embryo, root shoot, and emerging plant. The Asian gall rice midge has reportedly caused significant yield losses of 30-40% to rice crops in areas like Sri Lanka and parts of India

Each gall forming species of Midge Fly feeds inside one or a few related species of plants and to date daylilies, *Banksia coccinea* (Proteaceae), mango's, hibiscus, cyprus pines and some Eucalyptus have been observed as hosts. Alarmingly Phormium and Dianella species which recently have become very important in the nursery industry are also prone to attack.

### The good and bad side of the insect

Some Midge Flies are important predators of mites or small, soft-bodied insects and are natural enemies of other crop pests. The larvae of these species are predaceous, and some are even reported as parasitoids.

Their most common prey are aphids and spider mites, followed by scale insects, and other small prey such as whiteflies and thrips. Because the tiny larva are incapable of moving considerable distances, there usually has to be a substantial population of prey immediately present before the adults will lay eggs. For this reason Cecidiomyiidae are most frequently seen during pest outbreaks.

Other economically important types of Midge Fly include the;

- lentil flower midge (*Contarinia lentis*),
- the lucerne flower midge (*C. medicaginis*)
- the alfalfa sprout midge (*Dasineura ignorata*) on Leguminosae;
- the s midge (*Contarinia nasturtii*)
- and the brassica pod midge (*Dasineura brassicae*) on the Cruciferae;
- the pear midge (*Contarinia pyrivora*)
- the raspberry cane midge (*Resseliella theobaldi*) on fruit crops;
- the rosette gall midge (*Rhopalomyia solidaginis*) on goldenrod stalks.
- The citrus blossom midge can be a concern where mature, well nurtured and regularly watered trees have flowered prolifically, but failed to form fruit. Microscopic investigation can reveal infestations of the little known citrus blossom midge.



Picture of damage to a Dianella Species from the larvae of the Gall Midge Fly

### Conditions that encourage Midge Fly outbreaks

More moderate and wetter Summer/Autumn periods have encouraged Gall Midge to proliferate in recent years, and with the onset of the cooler winter months it then makes them more difficult to treat. Cecidiomyiidae are also most frequently seen during other pest outbreaks and this goes hand in hand with the seasonal variations described.

Treating Gall Midge takes some effort to achieve. These resilient bugs can be quite hard to eradicate as it is important to carefully treat each stage of the midge's lifecycle.

### Identification

The mature insect is difficult to distinguish from the common mosquito unless professional help is enlisted, however the larvae & pupae stages are very obvious with a small hand lens due to their luminous colour as shown in Dianella picture below and on page 2.

The plant stunting and leaf deformity, wilting and rolling are also symptoms observed on plants caused by drought, potassium deficiency, salinity, and ragged stunt virus, orange leaf virus and tungro virus diseases. The rolled leaves can also be associated with the symptom caused by rice thrips.

### Prevention

A program of Integrated Pest Management (IPM) is the best avenue for dealing with any insect and pest problem.

- Design a monitoring strategy
- up skill staff in what to look for – PADIL website is a great reference for staff
- check all incoming stock from other suppliers

- seek a competent diagnosis of the problem so treatment can be instigated correctly and succinctly
- Establish a crop hygiene program
- trim and clean up any plants showing signs of infestation
- clean up all leaf litter that drops onto pots or the ground
- Keep good records of monitoring and treatment
- Use data collected to plan a program of correction

The best prevention for both thrips and gall midge is to clean up, trim and suitably dispose of damaged and fallen leaves and spent blooms as they develop as often as possible. Daily maintenance is best of course, but if you can't manage it every day, try to clean them up once or twice a week at a minimum. This prevents the larvae from completing their feeding and from travelling down into the soil where they can pupate and overwinter. The idea is to break the life cycle by preventing the larvae from emerging from the bud and burrowing into the soil to pupate.

### Control

It is difficult to control the insect with insecticides due to the short period that the larvae are exposed. Once the larvae are enveloped by the needle within the gall, it is futile to spray it for control.

The recommended time for an insecticide application is when buds are at least 20% flushed and the temperature is such that systemic applications remain effective. This will kill most of the larvae before the gall forms.

- Drench pesticide into the soil:  
Use a systemic pesticide in the soil around the base of plants to kill any larvae that have burrowed into the soil. Bayer Tree and Shrub is indicative of a systemic pest control product that can kill the midge in soil given the correct timing.



Further damage to a Dianella species from Gall Midge Fly

- Sprays buds and plants with a systemic or knock down spray if visible and the climatic conditions are permitting of a good up-take
- Removal of infested plant specimens is time-consuming if large numbers of plants are being grown. There may be little benefit from this if there are infested plants growing nearby so blanket control must be looked at
- Granular insecticides are recommended for gall midge control. Use granules only after observing damage symptoms as it is difficult to obtain good control when the pupae gets into the soil or surrounding floor surface
- Divide areas of susceptible stock from other crop types with insect screens to reduce the movement of mature fly's
- Cultivation of resistant varieties in endemic areas is a most economical method but will often preclude many very profitable varieties from being grown
- As a final option when the Midge Fly is in the adult stage and taking to the wing install sticky fly traps and modify your control program to incorporate sprays to destroy the insects before they lay eggs.

Remember, as with all pests, prevention is both better and cheaper than the cure.

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