Apple and Pear IPDM

(Australia)

Apple dimpling bug

IPDM Quick Facts

- The pest commonly called apple dimpling bug in Tasmania (*Niastama punctaticollis),* is a different insect to the pest called apple dimpling bug on the mainland (*Campylomma liebknechti.).*
- Tasmanian apple dimpling bug *Niastama punctaticollis* has also been recorded from NSW and SA but does not appear to be an orchard pest in those states.
- *N. punctaticollis* is a pest in Tasmania where macrocarpa (*Cupressus macrocarpa*) windbreaks, or even solitary trees, are alongside orchard blocks. The damage reduces with distance from the macrocarpa.
- *C. liebknechti* is present in Qld, NSW, SA, and WA and damages apples in those states.
- Life cycles and management varies between the two pests. Always be sure that the management you are using applies to the pest in your orchard.
- Varietal susceptibility to dimpling bug damage varies with light coloured varieties like Granny Smith and Golden Delicious frequently damaged. Gala is also susceptible.
- Monitoring of macrocarpa in Tasmania and flowering wattle trees on the mainland in late winter-early spring before apples, pears and nashi reach spur burst will give an indication of local populations of dimple bugs.
- Pome fruit is most susceptible to damage by dimpling bugs between the pink bud and full bloom stages. If resident populations near orchards are easily detected, then a prophylactic spray at pink bud would usually be warranted. Refer to Chapter 6 for information about toxic effects of pesticides on beneficial species to avoid disrupting pollination and mite control.
- The variable action threshold for *C.liebknechti* is based on the number of bug-days accumulated during the flowering period from pink bud to petal fall.
- A threshold for *N.punctaticollis* has not been developed but in most cases spraying the nearby macrocarpa prior to pink bud on apples gives sufficient control.

- Although they damage developing fruitlets by feeding on the flower ovaries both bugs also prey on Helicoverpa eggs, aphids and mites.

The Pests and their Significance

Two species of Australian native insects are called apple dimpling bug. For both species feeding activities during and shortly after flowering distort fruit growth. Effected fruit is severely downgraded and often unmarketable although damage is superficial. Despite the similarity in the damage that these two insects cause, it is important to note that differences in their life cycles and habits mean management designed for one species is ineffective against the other.

Immature bugs are called nymphs because, although they are smaller, they resemble adults despite not having wings. Nymphs go through several developmental stages called instars in which they grow in size and develop progressively more evident wing buds.

Mainland Australia

The apple dimpling bug on mainland Australia is *Campylomma liebknechti*. It is present in all mainland apple growing states and often builds up large numbers in the inland Queensland channel country before weather patterns in spring cause dispersal East and South into the apple growing regions of the Queensland Granite Belt, NSW, Victoria and South Australia. Similar dispersal is thought to occur from inland Western Australia into the Southern apple growing areas of Western Australia. Adult *C.liebknechti* are greenish-brown bugs about 3mm long. They have spiny legs and a generally triangular shape formed by their wing-covers and dark bands at the base of the antennae. They have a distinctive sweet odour when squashed.

Campylomma liebknechti

C.liebknechti nymphs are a pale green colour and only the older nymphal instars develop characteristic black spines on the legs. The early instars can be confused with apple leafhopper (canary fly) nymphs but on closer examination the leafhopper nymphs have smaller, slender antennae that project laterally from the head and they also have a distinctly segmented, wedge-shaped elongated abdomen. The *Campylomma* nymph has thicker four-segmented antennae with a dark coloured joint between the first and second segments. They can also be confused with early instar green aphids but aphid nymphs are more globular and have cornicles ('exhaust pipe" projections) on the abdomen.

Campylomma 4th instar nymph (E. Beers)

While *C.liebknechti* causes serious damage to apples and minor damage to pears and nashi, it is also considered an important predator of Helicoverpa eggs, aphids and mites. It commonly feeds on 62 species of plants including Australian native

and introduced tree species such as tagasaste (*Chamaecystisus proliferus*), Chinese hawthorn (*Photinia robusta*), Geraldton wax and wattle (*Acacia sp*.). Wattle is an important host across mainland Australia and large numbers can breed up on a single tree.

Tasmania

The apple dimpling bug in Tasmania is *Niastama punctaticollis*. It has also been recorded from the Gammon Ranges in South Australia. This insect looks quite different to *C.liebknechti*. The adult *N.punctaticollis* is about 2mm wide and 7mm long compared to the smaller *C.liebknechti*. The green body contains red markings which are covered by the wings when the insect rests. The wings are dark chocolate brown with some green and red markings.

Adults lay their eggs in macrocarpa in the period from late September to November or early December. The eggs do not hatch until the following July. The hatched nymphs go through five developmental stages before becoming adult dimpling bugs.

Newly hatched nymphs are quite small (1.5mm long) but get longer with each new instar until mature nymphs are 5mm long. The body of the nymphs is pale green with red markings on the upper surface of the legs and the eyes are bright red. Nymphs have no wings but wing buds become more evident with each successive instar.

From late September until about the end of October adult bugs leave macrocarpa and feed on nearby plants, including apple trees.

Damage

The damage caused by both the Tasmanian and mainland types of apple dimpling bug is similar. The initial fruit development stages of apple are most vulnerable to damage from apple dimpling bug from pink bud through until one week after petal fall. Most damage occurs between early pink and complete petal fall, with the most severe damage occurring between early pink and full bloom.

The insects feed by inserting their sucking mouthparts into the developing flower bud, piercing the ovary and sucking the sap. Scarring associated with this "sting" site fails to expand and may become calloused and

scarred. This failure to expand leads to distortion of the fruit as surrounding healthy tissue grows normally. This gives affected fruit its dimpled appearance.

Apple dimpling bug shows a marked preference for flowers at full bloom. Fruit damaged severely by apple dimpling bug may be shed, resulting in a reduction in yield. Greater numbers of apple dimpling bugs lead to greater damage to fruit.

Similar symptoms

Boron deficiency can be confused with apple dimpling bug damage

It may be difficult to distinguish low levels of apple dimpling bug damage from damage caused by plague thrips (*Thrips imaginis*), green crinkle virus or nutritional problems such as boron deficiency without cutting the fruit. Thrips damage is surface deep whereas dimple bug damage goes deeper and by cutting the fruit in half through the dimple you will usually see that the core is deformed in line with the dimple. There are no deformities of the core associated with green crinkle or boron deficiency. Boron deficiency often causes deformities with associated corky areas to develop in the flesh of the fruit. Similar looking feeding damage by Harlequin bugs (*Dindymus versicolor*) and stink bugs has fine puncture marks in the skin. Green crinkle is a graft transmissible disease, primarily in Granny Smith apples, that results in deformed fruit with depression and wart-like swellings.

Prevention and good orchard management

Varieties

Damage seems more serious on lighter varieties such as Granny smith and Golden Delicious. This may be a result of sting sites and the associated dimpling being more obvious. Nonetheless it is logical that for a given level of actual damage darker-skinned varieties are less likely to be downgraded unless dimpled. Do not plant light skinned varieties in blocks prone to apple dimpling bug infestation.

Other hosts

Both types of apple dimpling bugs spend critical stages of their life-cycle on plants other than apples. In Tasmania, orchard damage is more likely where macrocarpa is close to the orchard. In mainland Australia, the most critical alternative hosts are wattle and tagastaste, although *C.liebknechti* can appear suddenly in large numbers as a result of weather events dispersing the bugs from inland breeding grounds.

If these tree and hedge species can be eliminated from the orchard surrounds there will be fewer winged adults available to move into the apple orchard during flowering. This strategy is likely to be more successful in Tasmania as *Niastama punctaticollis* relies on a much smaller range of tree species than its mainland cousin.

Crop thinning

If dimple bug numbers have been high early in the flowering period you may want to reconsider an aggressive chemical thinning program because it may remove good fruit as well as the dimple bug damaged fruit. Dimple bug damage causes severely damaged fruitlets to preferentially shed. Damaged fruit that has not shed naturally can be removed during hand-thinning.

Monitoring

The decision to manage apple dimpling bug should be made on the basis of the severity of damage it has caused in previous seasons, and the numbers of insects detected through monitoring. Monitoring should commence in other host trees (Acacia, Tagasaste etc for mainland Australia and macrocarpa for Tasmania) before apple trees are at the early pink bud stage. This will give an indication of the likely infestation pressure as apples become susceptible. For Tasmania, there are no registered pesticides for application in-orchard. Where monitoring of macrocarpa adjacent to orchards indicates that there are large numbers of dimpling bugs, it is wise to apply a suitable pesticide to the macrocarpa immediately to reduce the population before they move to the orchard

Guidelines for monitoring in apple orchards

- Start sampling apple trees at pink bud stage and sample twice weekly until petal fall
- Sample in the cool of the morning (before 9.00am), as the bugs become too active for accurate identification and counting when it becomes warmer.
- Dimple bugs are in greater numbers on the sunny side of the tree.
- Tap 20 flower clusters, on the sunny side of each of 5 randomly selected trees, over a container. A white ice-cream tub is very good as the bugs are more easily seen and the container is deep enough to slow their escape. In Tasmania concentrate the initial monitoring efforts in blocks close to macrocarpa trees because these blocks will usually be first and hardest hit by incoming bugs. On the mainland initial monitoring can be concentrated in rows or blocks closest to bushland or flowering wattles and other hosts but do not neglect to check other blocks that are at susceptible stages as weather fronts come through, especially with arrival of westerly or northerly winds in the eastern states and easterly or northerly winds in Western Australia.
- Record the number of dimpling bugs found and determine whether a spray is required according to thresholds (see below).

- Do not stop sampling after a spray; re-invasion from the bush is likely. Sampling after spraying will also assist you in determining the effectiveness of the spray.
- Poor sampling is likely to result in under estimation of dimple bug numbers which may lead to increased levels of damage.
- Ants deter dimple bugs. If ants are found in the sampling container move to another tree.

Thresholds

Early published thresholds for *Campylomma liebknechti* varied within the range of 2-4 apple dimpling bugs for every 100 apple flower clusters monitored proved problematic due to variation in the length of the flowering period and inclement weather sometimes interfering with sampling. To overcome this a threshold based on bug-days (cumulative bug activity) over the flowering period was developed in NSW.

- Bug-days are calculated by taking the average number of bugs captured on two sample dates and multiplying that by the number of days between samples. For example, if on the first sample date 2 bugs were captured and 7 days later 4 bugs were captured the average number of bugs = (2+4)/2=3, and the number of bug-days would be 3x7=21.
- The time available for ADB to damage fruit is the approximately 30 days between late pink bud and two weeks after petal fall even though bugs may be present after this time.
- The economic threshold (ET) developed in NSW was based on spraying with fluvalinate and took account of the cost of the pesticide and its application but not the non-target impacts of the pesticide.
- The ET for the total of 30 days was 44 bug-days based on sampling 100 flower clusters each sample date. The spray threshold ST (or action threshold) was then calculated as ST=ET/(FP-d) where FP=length of flowering period (late pink to 2 weeks after petal fall) and d= number of days after late pink bud.
- Using the ET of 44 bug-days and a flowering period of 30 days the equation becomes ST=44/(30-d). This means that:
    - at late pink the spray threshold is 44/30=1.47 bug-days
    - at 7 days after late pink ST=44/(30-7)=44/23=1.9 bug-days
    - at 14 days after late pink ST=44/16= 2.75 bug-days
    - at 21 days after late pink ST=44/9=4.9 bug-days
    - and at 28 days after late pink ST=44/2=22 bug-days.

The very low threshold between pink and full bloom generally justifies a prophylactic spray being applied at late pink and then the use of the variable threshold to determine if a further spray is required later in the flowering

period. It is important to minimise the number of sprays applied because those sprays can have a drastic impact on the survival of predatory mites, that control twospotted and European red mites, and parasitic wasps that control other pests. Chemicals other than fluvalinate are now registered against ADB and the spray thresholds for those products are likely to be higher, although they have not yet been determined.

What you do at this stage of the season sets in train a string of consequences, both planned and unplanned, that cascade through the rest of the season. See Chapter 6 for information on side effects of pesticides on beneficials.

Responsible use of pesticides

Mainland Australia

There is a critical period of approximately three weeks for protecting fruit. This period is from pink to one week after petal fall.

Consult your agronomist or pest management advisor about suitable pesticides to use against dimple bug. If your orchard has a history of dimple bug damage or there are large populations of dimple bug in surrounding vegetation a prophylactic spray at early pink bud is probably warranted. Check the active ingredient of recommended products against Table 4 in Chapter 6 for their compatibility with IPDM and not just their effect on bees. Plan for what chemical you will spray if dimple bug or thrip populations reach threshold levels after pink bud, by choosing a product safe to bees and that does not have a long residual effect on other beneficials.

If chlorpyrifos is to be used against dimple bug it should only be used as a prophylactic spray and should not be used after early pink bud, and spray drift on to flowering weeds, or nearby flowering trees where bees are likely to be working, should be avoided. The orchard cover crop could be mown before spraying to reduce bee fatalities but that means you have left it too late to be applying chlorpyrifos or other chemicals toxic to bees. Flowering weeds are important energy sources for bees working orchards and also for parasitoid wasps that prey on pest insects in the orchard. If Western flower thrips have been a problem in the orchard mowing the cover crop may push the thrips into the tree flowers and create more problems.

If spraying is required during the flowering period, regardless of how safe the chemical may be to bees, it is preferable to spray in the late evening after bees have stopped foraging.

READ THE LABEL AND STRICTLY FOLLOW ALL BEE SAFETY AND APPLICATION TIMING DIRECTIONS

Tasmania

In Tasmania pesticides are applied to macrocarpa in order to reduce the number of adult bugs prior to their arrival in the orchard. The optimum time to spray macrocarpa trees is the short period from mid-August to early September. A single application using drive past equipment is usually adequate. For tall trees, where the spray does not reach more than halfway up, a further application about three weeks later is advisable. In this case the

first spray should be applied early in the critical period so that the second application is not too late. Hedges should be sprayed from both sides. Chlorpyrifos is the only insecticide registered for this use. Hence care should be taken to avoid drift into the orchard, adjoining properties, pasture or waterways and the precautions listed above should be taken to protect bees.

More information

Bower, C., Page, F.D., Williams, D.G. and Woods W. 1993. Management of apple dimpling bug. Final Report HRDC project A/003/R1. 93pp.
Sivyer, M. and Learmonth, S 2005. Fact Sheet Note 178. Apple Dimpling Bug. Department of Agriculture and Food. Government of Western Australia. 2pp.
Williams, M. 1995. Dimpling Bug. Agdex 212/622. Number 374. In "Insect Pests and Diseases of Apple in Tasmania. Department of Primary Industries and Fisheries Tasmania. 2pp.