Bulletin No. 4500
ISSN 1326-415X
Agdex 241/622
Grapes/specific pests
September 2001

African Black Beetle in Vineyards

Department of Agriculture

Bulletin No. 4500
ISSN 1326-415X
Agdex 241/622
Grapes/specific pests
September 2001

African Black Beetle in Vineyards

By **Diana Fisher**, Viticulture Development Officer and
Stewart Learmonth, Entomologist,
Manjimup Horticultural Research Institute

Cover Photo: The red vines in this vineyard have been damaged by African black beetle adults.

CONTENTS

INTRODUCTION

The African black beetle, *Heteronychus arator*, is an important pest of horticultural crops, ornamentals and pastures in Western Australia. They also attack lawns and are commonly referred to as the black lawn beetle. This beetle was first recorded in Australia during the 1920s and originates from southern Africa where it is a major establishment pest of maize.

DESCRIPTION

African black beetle **larvae** are soil dwelling and are typical white 'curl grubs'. They have three pairs of legs on the thorax, a prominent brown head with black jaws and are up to 25 mm long. The abdomen is swollen; baggy and grey/blue-green, due to the food and soil they have eaten (Figure 1). The larvae, when fully grown, enter a short-lived pupal stage.

Figure 1. African black beetle larva. The large larva is final instar of African black beetle. The small larvae are last instar of pasture cockchafer and are the same size as first instar African black beetle larvae.

Figure 2. African black beetle pupae.

Pupae are straw-coloured and cylindrical and approximately 15 mm long (Figure 2). They emerge as adults after about two weeks.

The **adults** are usually found on or under the soil surface, to a depth of about 150 mm (Figure 3). They are a shiny black and cylindrical cockchafer that is slow moving and is approximately 15 mm long. The adult is capable of flying.

Figure 3. African black beetle adult.

LOOK ALIKE

The **larvae** can be confused with lesser pasture cockchafer (*Australaphodius frenchi*). However, larvae of the pasture beetle are never larger than first instar African black beetle (Figure 1). They are often cream coloured and if they occur at times other than spring, are almost certainly not African black beetle. Adult pasture beetles are around 3-4 mm long, which is much shorter than the African black beetle adults.

The larvae can also be confused with a range of native cockchafer species and close examination is required to distinguish them. Larvae of the native species are present in greater abundance through winter, whereas African black beetle is present mainly as adults at this time. Larvae of the African black beetle are more prevalent in coastal regions and are thus more likely to be found in coastal vineyards than native cockchafer species.

The **adults** of African black beetle can be confused with dung beetles (*Onitis alexis, Onthophagus binodis, Onthophagus ferox*) (Figure 4). Looking from above, the two body segments of dung beetles are almost equal in length and have the appearance of being well rounded, while the head segment of African black beetle is shorter than that of the wing covers. The adults of other cockchafers may also be confused with the African black beetle but these are not shiny black and often have prominent ridges along the length of the wing covers.

Figure 4. Dung beetle adults that may be confused with African black beetle adults.

LIFE CYCLE

There is one generation of African black beetle per year. The winter months are spent as actively feeding, non-reproductive adult beetles. During spring the adults mate and lay eggs. This behaviour coincides with an increase in the walking activity of the beetles. These adults die by the end of early summer (Figure 5).

These eggs hatch into grubs during late spring / summer, so adults and young larvae are found together. African black beetle larvae feed on soil organic matter in the early stages and plant roots as they develop. The larval stage is present from mid spring to late summer, they then change into pupae. Some large larvae can be found later than this, but represent a small proportion of the population.

The new generation of adults start to emerge from mid summer to early autumn. Adults feed whenever present, but more so in summer as young adults after emergence. Adults may undertake mass flights on warm sultry nights in late summer / autumn. Flight activity also occurs in spring, but numbers of beetles involved is much less. Flights can be detected using light traps or observing activity around lights near buildings or sporting venues. Such activity can lead to invasions of damaging numbers of beetles.

DISTRIBUTION

In Australia the African black beetles are found in south-west Western Australia and across mainland coastal eastern Australia up to south-east Queensland. It has been reported to be a pest of vines primarily in coastal south-west Western Australia and the McLaren Vale and Adelaide Hills areas of South Australia.

PEST STATUS

Across the regions infested by African black beetle, this insect can cause significant economic damage to horticultural crops such as young vines (newly planted cuttings and young rooted vines), olives and potatoes. They can also affect young ornamental trees such as blue gums and young thin wooded plants such as proteas. They are also pests in newly sown pastures and lawns, particularly kikuyu, couch and tufted perennial grasses such as perennial rye.

The African black beetle survives well in pasture situations. When such areas are used for vineyard cultivation, the resident population of beetles readily attacks the newly planted vines.

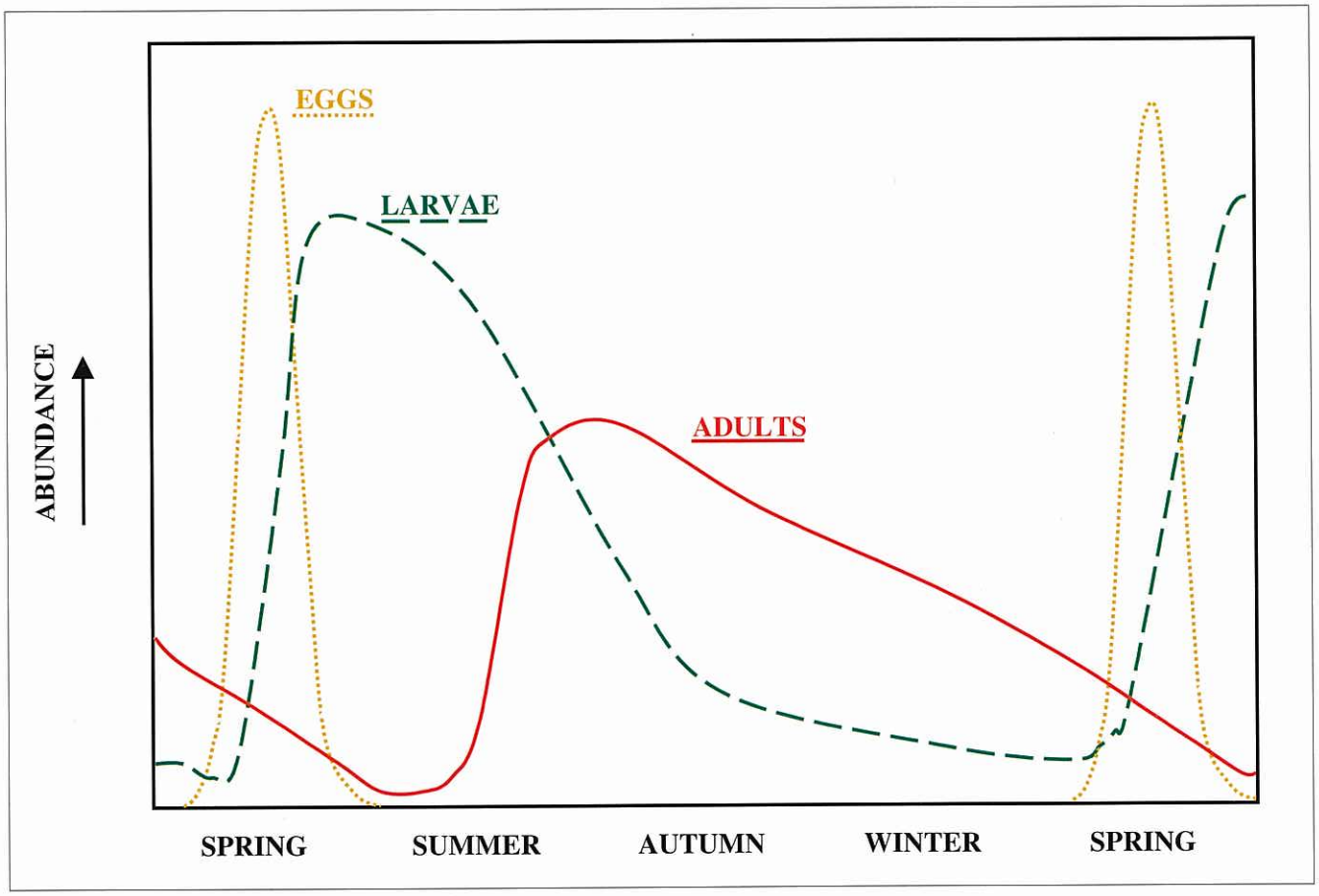

Figure 5. Seasonal abundance of the life cycle stages of African black beetle.

DAMAGE AND LOSS

Damage to vines by African black beetle occurs when they feed on the trunk of the young vine at or just below ground level. With continued attack, they can ringbark the vine, causing wilting and collapse. Damage occurs from mid summer as the new generation of adults emerges, through winter to early summer of the following season. While beetle activity may be lower during winter, beetles may still feed on and damage vines.

The presence of splayed fibrous tissue on the stem of the vine is a good indicator of beetle feeding (Figure 6). Above ground signs of beetle feeding may not be evident until damage is well advanced. Affected vines often appear with discoloured foliage that is red or yellow (Figures 7a and 7b).

Damage primarily occurs in the first two years after planting, because the vines become too woody to be damaged by the beetle after this time. However, older vines may still be damaged, especially if they have been stressed.

The impact of losing young vines is twofold - replant costs, especially if grafted vines are involved, and loss of yield through delayed grape production. The unevenness in vine maturity in the block presents management problems, for example in terms of weed control and vine training. Partial damage to vines by African black beetle can result in retarded growth and add to the cost of vine training because of the prolonged time that such vines require individual attention.

Figure 6. Close up of vine ringbarked by African black beetle adults – note characteristic splayed bark.

Figure 7. Discoloured vine foliage as a result of ringbarking by African black beetle adults. (a) Red grape variety on left, (b) white grape variety on right.

MONITORING

Prior to and after planting, particularly on old pasture or potato land, several monitoring options should be undertaken. These include:

1. **Adult flight activity** – this can be monitored, during summer / autumn, by the use of light trap catches or observing activity around lights near buildings. Flight activity can indicate invasions of damaging numbers of beetles (Figure 8).
2. **Soil sampling** - around six beetles per square metre would represent a potentially damaging population of adult beetles. There are 25 square soil samples per square metre taken with a 20 cm wide spade. Sample to a depth of 15 cm.
3. **Adult walking catches** - because the beetles are clumsy walkers, they tend to accumulate in pitfall traps (Figure 9) or sharp sided plough lines. Check traps fortnightly.
4. **Sentinel drenching** – this involves applying a drench of a spray solution containing the insecticide chlorpyrifos to either known areas or to the bases of tagged vines scattered across the vineyard. See Figure 10 for an example of a sampling plan for sentinel base drenching. Refer to NRA Trial Permit PER 4621 for spray solution details. The resulting dead beetles are counted. Around 6 or more beetles per square metre before planting, or recording a quarter or more vines infested, would indicate the need to take action. After planting, apply this insecticide every four weeks on the same or different vines. Check next day and two weeks later for dead beetles (Figures 10 and 11).

Because the susceptibility of vines lessens as they grow, healthy vines will require monitoring for fewer seasons than situations where vines are under some stress and are growing slowly.

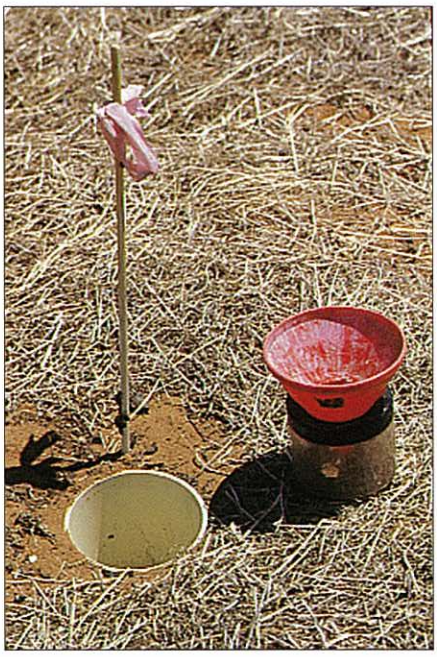

Figure 9. An example of a pitfall trap useful for detecting African black beetle adult presence.

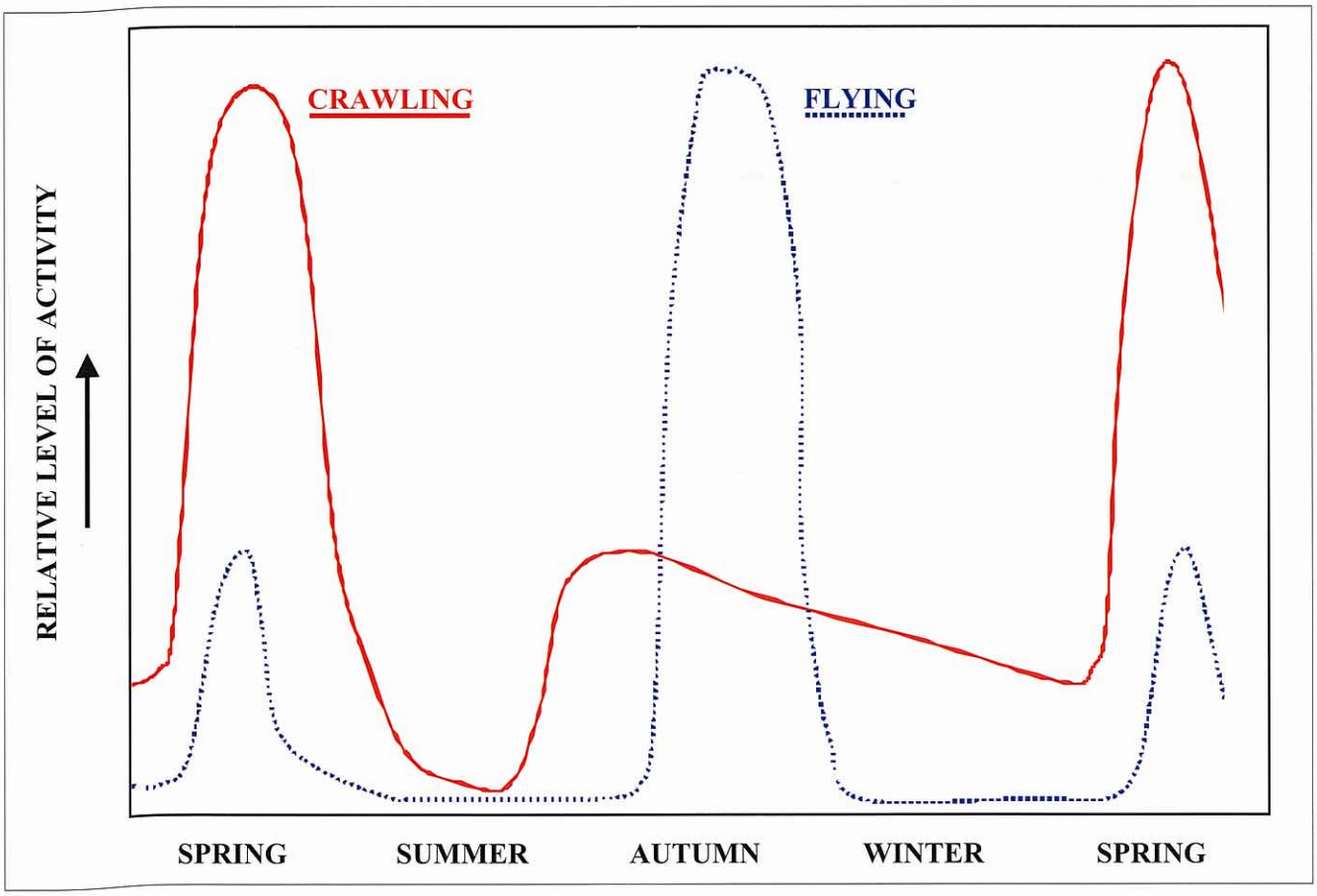

Figure 8. Seasonal crawling and flying activity of African black beetle adults

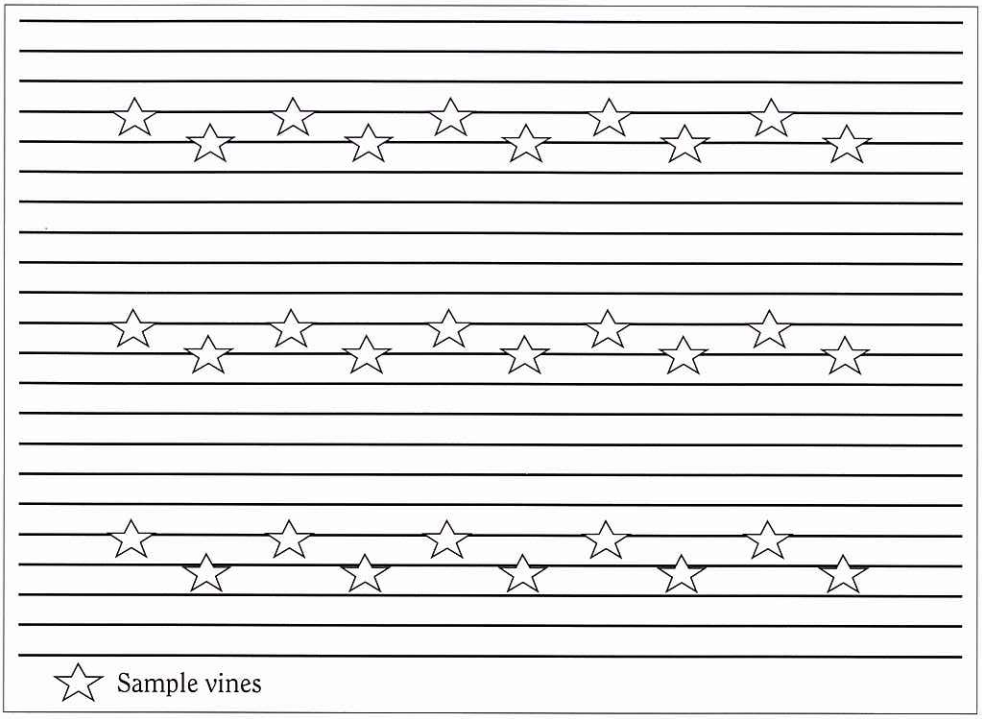

Figure 10. Suggested sampling plan for sentinel base drenching to detect African black beetle adults in a vineyard block.

Figure 11. Dead beetles at the base of an infested vine following sentinel drenching.

A suggested monitoring program for WA vineyards is outlined in Figure 12.

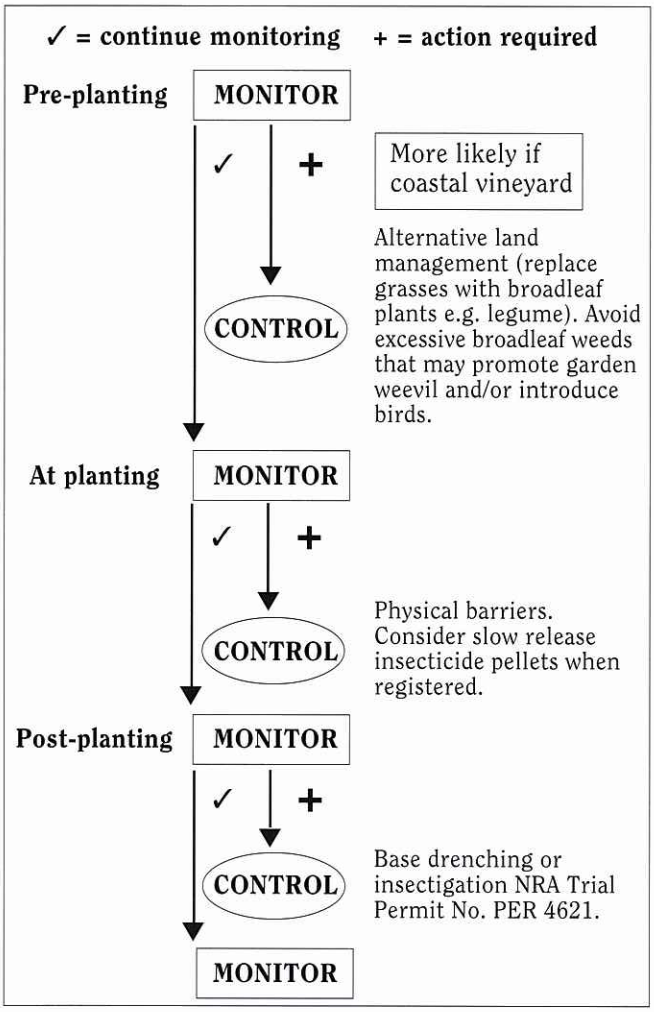

Figure 12. Suggested monitoring schedule for African black beetle in Western Australian vineyards.

MANAGEMENT OPTIONS

Cultural

Research in New Zealand has shown that the ability of the beetle to survive and reproduce is lessened if grasses such as ryegrass and paspalum are not present. In Western Australia, kikuyu and couch areas are also excellent reservoirs for the beetle. Where beetle infestations are found, altering the plant composition of such areas to less favourable plants, such as legumes (e.g. clover), well before planting should be considered.

The use of organic mulches along vine rows may encourage adult beetles to accumulate at the base of vines and increase damage.

If vines are attacked, mounding soil above the damaged section of the butt appears to have prevented vine death in one vineyard. Such mounds would still require additional management techniques, such as an insecticide treatment, to prevent subsequent beetle attack. Whether mounding ensures long-term vine survival is not known at this stage.

Physical

Plastic guards around individual vines if not buried can exacerbate beetle numbers.

Plastic mulch over raised vine rows at planting may limit the ability of beetles to crawl to the base of vines.

Biological

Birds such as guinea fowl and chickens are being used increasingly in Western Australia for control of a range of vineyard pests including wingless grasshopper, garden weevil and snails. They have been reported to feed on African black beetle. If vineyards are stocked with birds at the outset of vineyard development, beetles exposed in the process of ripping in preparation for planting, or the use of a winged ripper to expose more soil and hence more beetles, would aid this potential form of control.

A nematode (*Heterorhabditis zealandica*) native to New South Wales is commercially available for beetle control in turf by Ecogrow. Because of their likely cost and requirements for moisture, their applicability in vineyards may be limited.

Chemical

Resident populations of African black beetle can be reduced by applying insecticide to the soil surface in late winter as the crawling activity of beetles increases. This is before the beetle commences egg laying in spring and therefore can help reduce the numbers of beetles present for a longer period. However, such areas can be invaded by flying beetles in the following autumn.

Figure 13. A crew of four base drenching for African black beetle control.

Because of the type of feeding activity of African black beetle in vineyards, it has been necessary to investigate specific insecticide use strategies. Research in Western Australia has now provided data on efficacy of base drenching and insectigation through dripper irrigation systems with chlorpyrifos insecticide, together with insecticide residue levels for treated grapes. The National Registration Authority has approved a Trial Permit No. PER 4621. Contact Agriculture Western Australia or chemical re-seller for details of this Permit and the latest information on insecticide use.

Other research and demonstration studies are testing a slow release formulation of chlorpyrifos that can be applied at planting to give sufficient duration of activity to protect newly planted vines during the susceptible period. Other insecticides and other methods of beetle management are being examined.

REFERENCES

- Learmonth, S.E. (1988) *Identifying soil insect pests – beetles*, Farmnote No. 75/88, Agdex 611, Agriculture Western Australia, Perth.
- Learmonth, S.E. (2000). The African black beetle threat to vineyard establishment. Australian Grapegrower and Winemaker Annual Technical Issue. No. 438a: 97, 99-100.
- Matthiessen, J. and Learmonth, S.E. (1991) *African Black Beetle*, Farmnote No. 17/91, Agdex 622, Agriculture Western Australia, Perth.

004759/2001-2M-Touchstone