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The Redheaded Pasture Cockchafer

This agnote describes the life cycle and growth habits of the redheaded cockchafer in the dryland dairying areas of south-eastern Australia.

Introduction

In Victoria the redheaded cockchafer, *Adoryphorus couloni,(Bermeister)* is periodically a common pasture pest, especially in some areas of South West and Central Victoria and Gippsland districts. It is also a pest of pasture in NSW (particularly in the southern tablelands), South Australia (lower south-east region) and Tasmania (northern area).

It appears to be a problem in areas where the annual rainfall is greater than 500 mm, but is only problematic in the drier years in these zones. The wetter seasons results in a substantial reduction in their population possibly due to drowning, disease and being trampled by animals.

They tend to be more prolific on the lighter sandy loams and silty loam soils but in the 2006/07 drought, were occasionally found on clay loams of the flats. This is probably due to the extended dry period theses soils had experienced since the very wet years of 1995 and 1996.

Identification

The adult beetle is a squat beetle of approximately 13 - 15 mm long and about 8 mm wide and dark brownish-black in colour (Figure 1). The cockchafer "grub" (Figure 2) which causes the pasture damage, is the larval stage of the red headed cockchafer life cycle. Their body is soft and white-grey in colour when feeding in their earlier growth stages and become white when mature.

The older larvae have six yellowish legs and a hard reddish-brown head. Their body wall is transparent. Newly hatched larva are about 5 mm long but grow to 25 – 30 mm long as adults and about 5 mm in diameter. The redheaded cockchafers tend to curl into a C-shape on exposure or when handled.

If the blackheaded and redheaded grubs are placed together, the blackheaded grub will crawl off quickly whereas the redheaded grubs may take some minutes to move. Young blackhead cockchafer grubs can also have reddish heads in their early instar stages and so may be incorrectly identified as redheaded cockchafers.

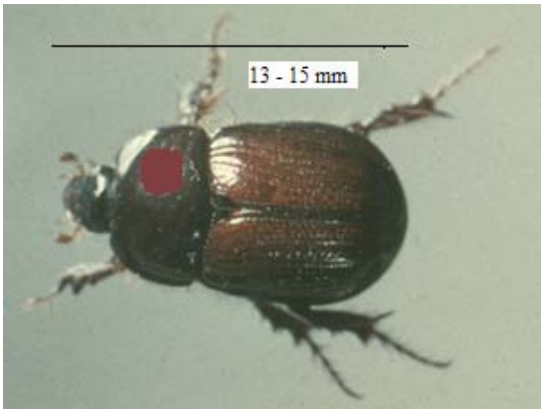

Figure 1.Redheaded cockchafer adult (beetle)

There are also yellow headed and orange headed cockchafers in existence but are not recognized as being a problem to date.

Figure 2.Redheaded cockchafer larva (3rd. instar)

Life-cycle and growth habits

The redheaded cockchafer has a life-cycle of two years, most of it spent underground (Figure 3). The adult beetles emerge from the soil from late winter to early spring (end August to early October) and fly at dusk, to mate before egg-laying.

The females lay their eggs singly at depths of 10 – 50 mm in the soil under pastures with a dense cover.

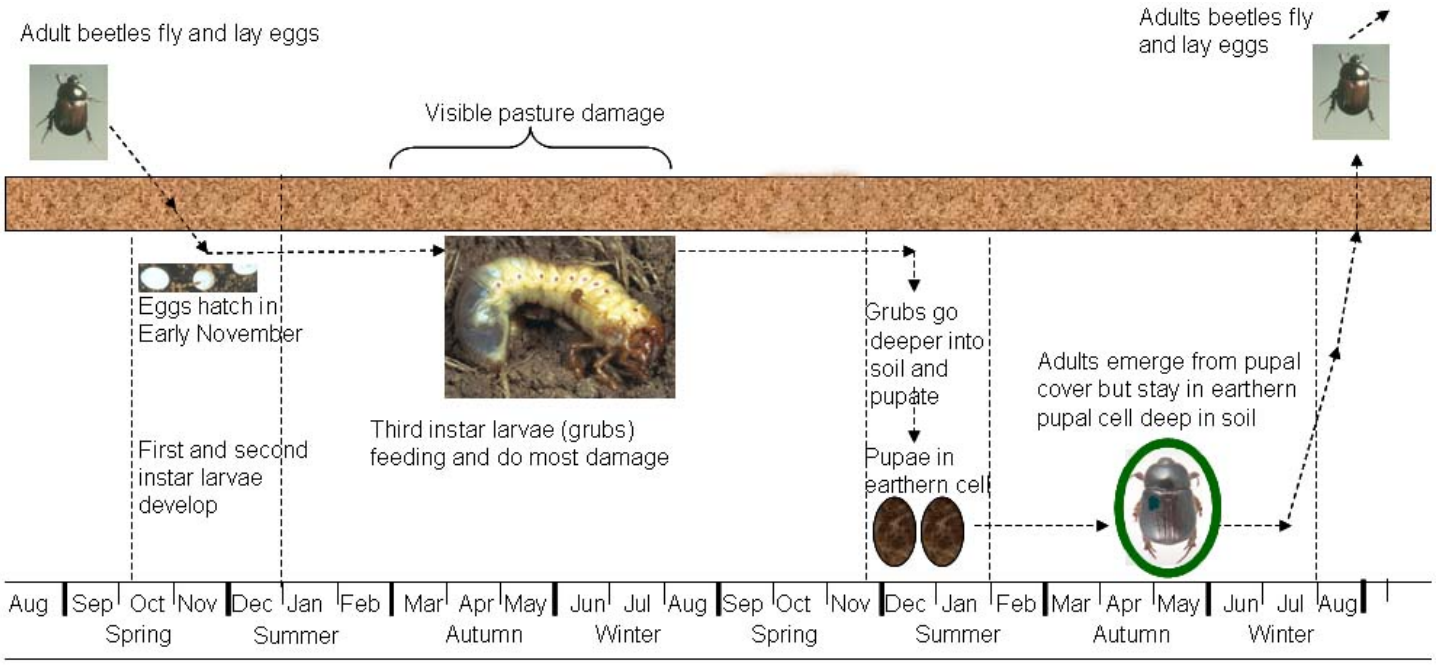

Figure 3 Life cycle of Redheaded pasture Cockchafer

This cover apparently aids survival of young larvae during spring and summer.

The eggs hatch in late spring about 6 – 8 weeks after being laid. The first two larval stages, called instars, last 6 - 8 weeks. The larvae reach the third and final instar by early autumn and remain in this stage until summer.

All three larval stages feed on decaying organic matter, humus and plant roots in the soil but it's the last stage which causes most damage due to their feeding in autumn and winter.

At about one year of age the larvae change to a creamy colour and move deeper (100 – 300 mm) into the soil in December – January to pupate in earthen cells. The ginger brown pupal stage lasts 6 – 8 weeks. The adults (as beetles) then emerge from the pupal covering by the end of January - February, but remain in the pupal cell until August. They then dig their way to the ground surface to fly and repeat the cycle. Dissections of the beetles have shown they do not feed.

Nature of cockchafer damage

Unlike the blackheaded cockchafer, *Acrossidius tasmaniae*, which comes to the surface to feed on green pastures and clovers, the redheaded cockchafer grubs remain below the surface at all times. The grubs feed on organic and root material in the top 100 mm of soil. When many larvae are present, pasture root systems are cut about 25mm below the soil surface. and the pasture can be easily rolled up like a carpet.

In the past, damage occurred every other year, because of the two-year life-cycle of the cockchafer. Now extensive damage is occurring as a result of a build-up of overlapping populations. Damage can range from isolated patches to very large areas. Substantial losses start to occur when larvae number exceed approximately 70 larvae per square metre in March, and population numbers have been known to reach over 1000.

Low soil temperatures in winter slows down the larval activity which resumes when the soil warms in late August with feeding continuing till early summer. However, the milder winter periods of latter years may not have reduced this activity as much as in the past.

Plants most affected

Pasture species that are shallow-rooted such as subterranean clover, Yorkshire fog, barley grass and annual and perennial ryegrasses are most susceptible to attack by redheaded pasture cockchafer larvae. To date, no endophyte has been identified which offers plant protection from the redheaded cockchafer. Wheat has also been known to be stunted by this cockchafer.

Deep-rooted plants such as lucerne, cocksfoot and phalaris, are less susceptible to damage.

Paddock indications of redheaded cockchafer damage

The extent and severity of damage varies markedly from year to year and from property to property. Most damage becomes more obvious by May to early June.

The main indications of their presence is most evident during a dry spell after the autumn break, when dead pasture is found among areas of green.

Unlike the top feeding blackheaded cockchafer which has obvious tunnels, the redheaded cockchafers feed underground and remain below the surface so do not produce tunnels.

Clumps of dead and sometimes green pastures being "pulled" or uprooted by grazing animals and birds is another obvious sign (Figure 4). Large flocks of crows and ibis are good indications of the presence of a pest of some type and worth closer inspection. However, damage due to the blackheaded cockchafers is the disappearance of grass in ever increasing area size.

Figure 4. Pasture damage as result of cockchafers

In severe dry periods the topsoil may even appear like a "talcum" or fine powder and very soft to walk on.

Often rain or stock traffic will remove signs which may have helped to pinpoint the culpable cockchafer such as tunnels used by the blackheaded cockchafers. Use a shovel to dig to at least 200 mm depth in suspected areas of pasture to determine which species has caused the damage or if it's a combination of both.

In wet autumns, damage from heavy infestations may not be apparent as the soil remains wet enough for the root-shortened pastures to survive and eventually recover, albeit in a much weakened state. However, these wetter pastures may also become much more easily pugged and vehicle traffic much more damaging.

Control and recovery techniques

Chemical control

There are no known preventative management options and currently no insecticides registered for the control of redheaded pasture cockchafers. The underground feeding habit of the larvae gives them cover from insecticides.

A recently developed biological control, Chafer Guard, formerly known as BioGreen™ Granules, was based on a fungus, *Metarhizium anisoplaie*. The granules containing the fungi were drilled into the soil and then attacked both the larva and adult stages of the redheaded cockchafer. Unfortunately the product has been removed from the market due to production problems.

Currently, a strain of an entomopathogenic nematode, *Heterorhabitis zealandica*, is the only product available for control of a number of turf and nursery pests, including redheaded cockchafers. The product, "Weevilnem" is produced by Ecogrow Australia Pty Ltd but is very expensive (~$3000/ha) due to high rates required. The product also requires a pre and post irrigation and so greatly restricting use in most pasture situations. **Registration of this type of product is not required.**

Desperate measures such as substantially increasing the rate of the registered spray used for blackheaded cockchafers and/or dramatically increasing the amount of application water in the hope of the spray penetrating the soil to reach the redheads, have been tried. These techniques are not registered uses for these chemicals, The increased chemical rate will possibly kill beneficial soil organisms, have no effect on the target cockchafer anyway and can leave the user open to legal ramifications.

Recovery options

Unfortunately, little research has investigated the recovery of pastures or techniques to re-establish pastures while the cockchafer is still active in the soil.

Re-sowing damaged pastures by direct drilling with perennial ryegrass can be disastrous as the newly established root systems of the new pastures will also be attacked. The new seedlings have little residual energy stored in their lower stems to aid recovery. These new plants may survive as weakened and sparser pastures prone to weed infestation or they may often die.

If re-sowing is delayed till the cockchafer activity ceases, the cold conditions prevailing will lead to be slow pasture establishment and delayed growth for several months.

The following suggestions are based on the anecdotal experience of farmers and contractors and not scientifically backed, but are worth considering.

Re-sowing with soil disturbance

Re-sowing by using equipment which churns the top 3 – 5 cm of soil, such as a roterra, appears to greatly reduce further cockchafer damage. This activity either damages the very vulnerable grubs and/or exposes them to flocks of birds and other predators thereby reducing their effects post-sowing.

Unfortunately this leaves a soft seedbed which may lead to pugging, resulting in less dense pastures if the paddock is too

wet when grazed. Also re-sowing a large area of the farm at this late stage will dramatically increase the grazing pressure on the remainder of the farm, thereby requiring extra supplement to avoid overgrazing.

Consider also that after an extensive dry period, north-facing slopes tend to be more affected by the redheaded cockchafers than south facing one. It may be well worthwhile re-sowing these particular paddocks, using a soil disturbing machine, in the year when damage is occurring rather than if these same paddocks were ear-marked for renovation the following year.

Perhaps, in years of expected cockchafer damage (after long dry periods the previous year) consider leaving pastures in the north facing paddocks short in late spring by either grazing them well or cutting them for silage.

Other species

A variety of perennial ryegrass, "Victoca" is a recently available strain developed by TasGlobal seeds. This strain was developed from plants selected from pastures undergoing drought and damage by redheaded cockchafers. It is said to be deeper rooting, more tolerant of waterlogging and quick to recover after summer.

Oats, but not wheat, may also be drilled into infested patches to replace missing green feed, as oat roots are seemingly not attacked by redheaded cockchafer larvae.

Deeper and more fibrous rooting plants such as Lucerne, cocksfoot and phalaris may be an option in some situations.

Rolling

Rolling damp, but not too wet, infested pastures can be of use by re-establishing contact of the truncated roots with the soil.

Pasture management

It has been suggested that the redheaded cockchafer beetle favours laying its eggs in longer pastures in spring for increased survival of its eggs and young larvae. Observations of heavier infestations have been noted in undergrazed pastures compared to adjacent pastures which had been well grazed. To exemplify the above observations a paddock cut early in spring for silage was not affected by cockchafer grubs but an adjacent paddock cut for late hay was badly affected next autumn!

In contrast, the blackheaded cockchafer beetle seemingly favours short pastures for laying its eggs in summer. No research has verified either of these observations.

Despites these above observations, pasture management should be based on principles of achieving maximum growth of high quality pastures at all times of the year. This requires pastures to be 2.5 – 3 leaves before grazing and grazing residual height of about 5 cm between clumps after grazing.

Liming

Recently liming has been anecdotally linked to reduced cockchafer problems. This has not been proven scientifically and the results may be linked to long grass at flying time, chance landings elsewhere, etc. A recent short term plot trial, using slaked lime to speed up reaction time, gave no control at all. Research is needed to assess whether liming is a viable control technique.

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