Perennial ryegrass management
VIII. Management of weeds, pests and diseases

The focus of this Information Sheet is on the major weeds, pests and diseases that affect dairy farm systems in southern Australia. It is not a comprehensive review of the life cycle, threshold damage levels and control methods of all the pests that can affect perennial ryegrass. It uses the 3030 Project experiences to discuss how to manage these weeds, pests and diseases with the whole farm system in mind.

The weeds and pests covered are:

Weeds
- Barley grass.
- Erodium.
- Capeweed.

Pests
- Black-headed cockchafer.
- Red-headed cockchafer.
- Red-legged earth mite.
- Lucerne flea.

Diseases
- Crown rust.

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State Government Victoria Department of Primary Industries

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Weeds

Barley grass (*Hordeum leporinum*)

Barley grass is an annual grass weed that germinates faster than other grasses in response to the autumn rains and can provide valuable autumn and winter feed when still in the vegetative stages. However, its overall dry matter (DM) production is very low compared to improved pastures from early/mid spring onwards because the plant matures early.

Barley grass produces unpalatable seed heads from early to late spring before the plant finishes its cycle and dies (see Figure 1). There is no evidence that barley grass can produce hard seeds and so 99% of the seed produced in spring will germinate in the next autumn if the conditions are favourable. Barley grass seeds are readily dispersed by animals or as a contaminant of hay and feed grains.

Figure 1. Barley grass plant with elongated stems carrying seed heads. (Photo: S. Navie).

Barley grass is common in areas of high fertility. It normally establishes where patches of bare ground appear after ryegrass plants die.

There is a limited range of post-emergent selective herbicides available to control barley grass in perennial ryegrass pastures. There have been reports of it showing resistance to paraquat, diquat and also some grass herbicides of the Group A or 'fops' family.

The most successful control strategies combine a glyphosate application (killing all plants present) in autumn after the barley grass plants have germinated and show at least two leaves and a repeat application in spring to stop seed production for the following year. Mechanical control (topping) in the spring will have little effect as the plants will just keep producing seed heads until they die in late spring.

Three years of paddock observations at a 3030 Project partner farm in south-west Victoria provided some lessons regarding different strategies to control barley grass in ryegrass pastures.

Paddock 1

First year

- Paddock of old perennial ryegrass oversown with an Italian ryegrass in the autumn of 2007.
- The paddock produced a lot of feed over the winter/early spring but after silage was cut the regrowth was mainly barley grass.

Second year

- The paddock was sprayed 9 April 2008 (10 days after the first rains) with 2 L/ha of glyphosate and drilled the next day with 30 kg/ha of an annual tetraploid ryegrass plus 1 kg/ha of a brassica mix.
- Silage was cut in September 2008 and the paddock sprayed with 2 L/ha glyphosate and 300 mL/ha of dicamba for more effective control of broadleaf weeds, ploughed and resown to leafy turnips (Appin).

Third year

- On 14 April 2009 the paddock was sprayed with glyphosate, ploughed and resown in dry conditions with perennial ryegrass at 25 kg/ha.
- In June 2009 the perennial ryegrass had germinated well and the plan was to spray the newly germinated capeweed and give the paddock a light graze with 12-month-old heifers once the ground was firmer.

The observation from the Partner Farm support group of local farmers and advisers was that the approach was an effective way to clean the barley grass out of the paddock but was rather expensive. The added costs of cultivation could have been avoided by direct drilling the summer crops and/or the ryegrass.

Paddock 2

In August 2008 a night grazing paddock was severely infested with barley grass. Three strategies were considered:

1. Sow in early April 2009 with a low-cost annual ryegrass or annual ryegrass/brassica combination. Spray out the pasture out with glyphosate by 15 August and sow down to a brassica by the first week of September.
2. Wait until after the autumn break in 2009, when all the barley grass is germinated, and spray the pasture with glyphosate before re-sowing to a cheap perennial ryegrass at 40 kg/ha. After the first grazing, spray with propaquizafop to kill the remaining barley grass. After the second grazing, spray again with propaquizafop to kill any late-germinating barley grass. This alternative avoided spending money on expensive pasture seed if it was going to be invaded with barley grass. The higher sowing rate was to provide greater competition with the barley grass and a solid base to recover from the propaquizafop herbicide spray.
3. Sow paddock to a perennial in April and spray with ethofumesate to control the barley grass. The issue with ethofumesate was its cost (~$100/litre in 2009 when this was reported; it was applied at 3–4 L/ha).

The disadvantage of option 2 was that the paddock was unlikely to provide any feed until August/September. Given the importance of this paddock in terms of capacity to produce feed during the winter, option 1 was selected.

Paddock 3

A paddock with a 50:50 ratio of perennial ryegrass and barley grass was identified.

The recommendation was to wait until the first rain in mid-April and once the barley grass was at a two-leaf stage spray with 500 mL/ha of glyphosate. This light rate was expected to kill the barley grass as long as there was good contact between the grass and the herbicide. These paddocks were then to be oversown with perennial ryegrass.

Capeweed (*Arctotheca calendula*)

Capeweed is an annual broadleaf weed that germinates during autumn and winter with less rainfall than is required for pasture germination. As a result, it competes strongly with pasture seedlings in autumn.

Capeweed is adapted to fertile soils and tends to colonise areas of bare ground in a pasture sward (Figure 2). It is known for its capacity to tolerate drought conditions better than most crops and pastures. It has been reported that 20% of its seed can remain dormant for more than two years but this depends on the ecotype (sub-types within the same species which have been developed in a region) and on how deep the seed is buried.

Figure 2. Capeweed at the flowering (left) and seedling (right) stages. (Photos: A. Storrie (left) and Pritchard & Dettman (right)).

Under particular circumstances (such as when grazed by hungry animals, after the weed was sprayed with hormone-based herbicides, or after nitrogen applications) it can cause nitrate or nitrite poisoning in cattle (the excess nitrate is absorbed from the rumen to the bloodstream and this causes anaemia, which can quickly kill animals).

Capeweed is relatively easy to eradicate if controlled early. There are several options, depending on the pasture composition and maturity. It has shown some resistance to paraquat and diquat. As pre-emergent herbicides, the active ingredients diuron and picloram have shown good control. Post-emergence, clopyralid provides satisfactory control even for late applications.

The practical experiences from the 3030 Project have shown that most spray applications are effective when capeweed is at the 8-leaf stage but not more than 75 mm in diameter.

If plants become older than this, a 'spray-graze' strategy was used:

- Apply low rate of hormone herbicide (e.g. 2,4-D or MCPA). Remember to avoid spraying when plants are under stress as cape weed will accumulate nitrates.
- Wait for the withholding period (check label but it is 7-10 days for most hormone herbicides).
- Graze hard (below 4 cm) after the withholding periods to enhance kill rate (this may reduce regrowth of desired species).

Erodium or corkscrew (*Erodium cicutarium*)

Erodium is a broadleaved annual weed that germinates after late summer-autumn rains (Figure 3). It is most prevalent in sandy or gravelly soils. Erodium is similar to capeweed in terms of growth pattern, drought tolerance, autumn seedling competition and colonisation of bare ground.

Figure 3. Erodium at the vegetative (left) and flowering (right) stages. (Photos: A. Pritchard & Dettman (left) and Biopix.dk (right)).

Several broadleaf selective herbicides such as hormone herbices (e.g. 2,4-D or MCPA) can be used to control erodium in pasture. The range of herbicides is narrower if there is a legume component with the perennial ryegrass. There are selective herbicides such as a mix of terbutryn and MCPA that can be applied once the clover has more than three trifoliated leaves. Applications in the early stages of the weed give better results since it is a difficult plant to get good chemical contact due to the fern leaf. Early applications can use lower rates, which reduces control costs.

The 3030 Project south-western partner farm near Colac had a heavy infestation of germinating erodium and barley grass in paddocks sown to Italian ryegrass in April, with the potential to choke out the germinating grass. The support group recommended spraying with 1 L/ha of glyphosate to kill the germinating barley grass and 75 mL/ha of oxyfluorfen to kill the erodium.

The 'spray-graze' technique has been used to control erodium on pasture. It involves a sub-lethal dose of a selective herbicide such as 2,4-D or MCPA 6-8 weeks after the autumn break followed by very heavy grazing (see the capeweed section for details on 'spray-graze').

Pests

Black-headed cockchafer (*Aphodius tasmaniae*)

Black-headed cockchafers have a one-year life cycle. The adults emerge from the ground in summer (around January) and lay their eggs in the soil underneath short pastures. The larvae (see Figure 4) emerge in the autumn to feed from plants. Black-headed cockchafers do not prefer the extremes of heavy clay or very sandy soils, and numbers can decline significantly if the soil is saturated.

Figure 4. Black-headed cockchafer grub. (Photo: DIPIPWE Tasmania).

The black-headed cockchafers come to the surface only at night and particularly after rain or heavy dew. They chew off grass leaves and drag them back down their tunnel for later feeding. The pasture damage can occur from April and would normally peak around May–June. From July onwards, the grubs mature and turn progressively to a more creamy-yellow colour as they accumulate the fat reserves necessary for pupation (the non-active phase). They usually continue to feed until they enter a pre-pupal stage in late August when their activity stops.

Although the larvae has a characteristic black head, in the early stages they can also have reddish heads and may be confused with red-headed cockchafers. The damage is differentiated from the red-headed cockchafer by the visible tunnel with castings around the entrance left by the black-headed cockchafer and also because ryegrass plants physically 'disappear' from the ground.

Broad-leaved weeds and unimproved pasture species such as bent grass are left untouched in the affected areas. An estimation of the severity of the cockchafer infestation can be obtained using a shovel in the unaffected pastures near the damaged areas to a spade head depth. As a rule of thumb, if two or more black-headed cockchafer grubs are found per shovelful, insecticide spraying should be considered. The use of registered insecticides such as alpha-cypermethrin at 100 mL/ha has proved effective if applied early and the pasture is not very dense. The pasture should not be grazed within three days of alpha-cypermethrin being applied.

The grubs are not active during dry warm weather or in cold conditions. Therefore, the insecticide should be applied just before rain or when a heavy dew is expected, but allowing enough time after the rain (~4 hours) for the spray to dry and prevent it being washed off the foliage. Alternatively, it could be applied immediately after the rain.

When re-sowing due to severe cockchafer attack, any cultivation causing a soil disturbance of the top 3-5 cm of soil reduces the chances of future attacks. This is because the cultivation damages the vulnerable grubs and exposes them to be consumed by birds.

At the 3030 Project south-western partner farm, the black-headed cockchafers were monitored after the autumn break and their spraying was timed to coincide with spraying for RLEM in order kill both at once.

Red-headed cockchafer (*Adoryphorus coulonii*)

The red-headed cockchafer has a two-year cycle. The adults lay eggs in summer and the emerging larvae, which damage pastures, feed from organic matter and plant roots underground and will remain 2–4 cm below the surface until the next summer, when they will emerge as adults.

The attacks can start as early as the end of March and the damage will normally peak by the end of May–June. However, the larvae activity slows during the colder weeks of the winter (typically July). Wet springs stimulate adults to lay eggs, which increases the chances of higher populations of grubs being present the following year (see Figure 5).

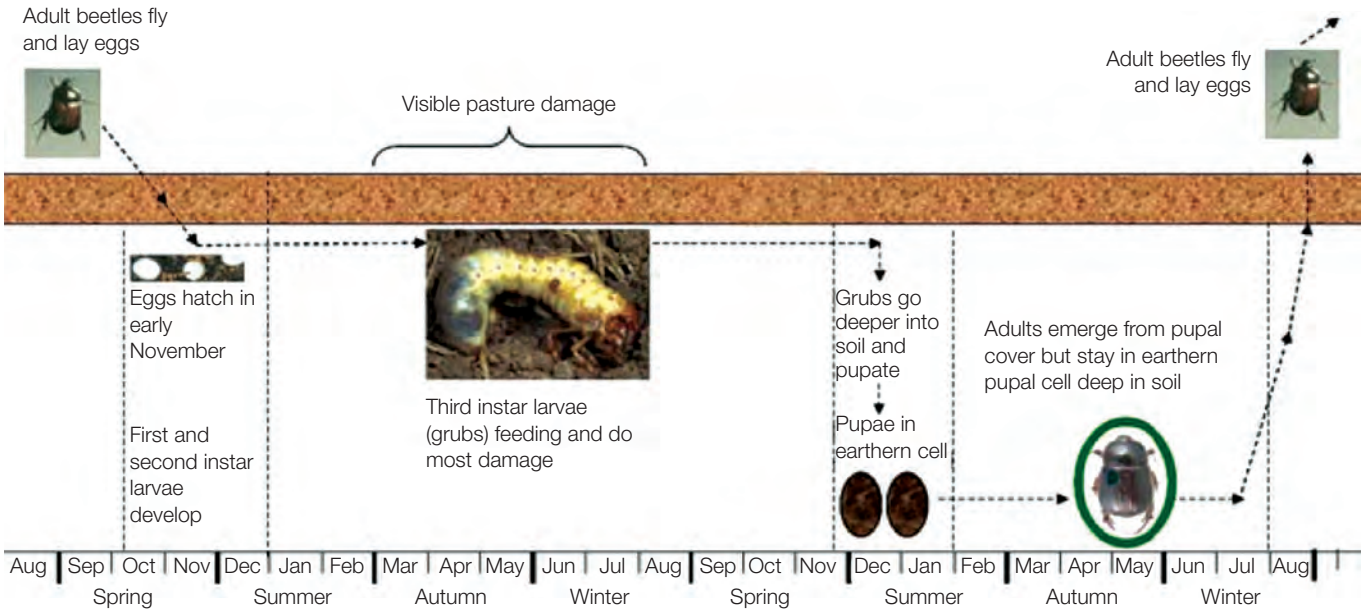

Figure 5. Life cycle of the red-headed pasture cockchafer (from Mickan, 2008).

The body of the larvae is similar to that of the black-headed grub, but their heads are red or orange (Figure 6).

Figure 6. Red-headed cockchafer grub. (Photo: DPI Victoria).

The damage can be distinguished from that of the black-headed cockchafer as there are no tunnels visible and, because they consume the roots at 2–4 cm deep, the attachment of the plant to the ground is weakened and pasture clumps may be turned over with the 'pulling' by grazing animals or flocks of birds searching for the grubs. When the damage is advanced and soil moisture limiting, plants die and can be seen among the remaining green plants. However, with increased rainfall in autumn and abundant moisture in the top soil, the damage is sometimes not noticeable until the pasture clumps are turned over.

There are no insecticides registered for the specific control of the red-headed cockchafer. On affected paddocks, re-sowing ryegrass by direct drilling usually exposes the newly sown pasture to cockchafer attack unless done in the winter when the soil temperature has limited the grub activity (although this might be at the expense of a slow establishment of ryegrass).

One of the observations from the 3030 Project south-western partner farm was that perennial grass species capable of regenerating themselves from the production of seed can be used as a management strategy to thicken pasture and manage the impact of red-headed cockchafers.

After years of very intense attacks, some farms have chosen to reduce the risk of impact on the whole farm by sowing alternative species that are not affected by the red-headed cockchafer, such as chicory or brassicas or changing to other perennial grasses such as tall fescue.

In general, the 3030 Project has shown that any management practice that can maximise root mass and plant vigour of perennial ryegrass will increase the plant's chances of fighting off a red-headed cockchafer attack. For instance, grazing closer to the 3rd leaf maximises accumulation of carbohydrates in the root and should increase the chance of minimising the impact of an attack. Anecdotal evidence also has shown that, under similar levels of infestation, there was less 'pulling' of plants by cows in pastures with higher proportion of leaf to stem. This is because leaves will break off during grazing before the roots pull. Nitrogen (N) nutrition helps increase the leafiness of ryegrass. However, under heavy infestations there isn't much you can do.

For more information on cycle and management of the red-headed cockchafer see the comprehensive review prepared by G. Berg (2008) for the Gippsland dairy region.

Red-legged earth mite (*Halotydeus destructor*)

The red-legged earth mite (RLEM) is one of the major threats to perennial ryegrass establishment. The RLEM is active from April to November and common in regions with hot/dry summers and cool wet winters.

The RLEM hatch from over-summering eggs when there is a combination of cool weather and moisture. In practice, this means three weeks after a weekly maximum daily average below 21°C combined with significant rainfall. It is common to see RLEM appearing first on the higher sections of a paddock.

Newly sown pastures should be checked regularly for 3–5 weeks after sowing. Silvery patches on the upper surface of the leaves are characteristic signs of RLEM damage. Although the damage is relatively distinctive, the presence of the mites is usually more difficult to determine as they are very small (1 mm long; see Figure 7) and they hide when they sense an observer's presence.

The monitoring should be done in the morning or on overcast days, since the mites tend to hide at the base of plants or crawl into cracks in the ground to avoid heat and cold. Approach the patch very quietly and observe for 30 seconds to check for RLEM presence. If the mites are not seen on seedlings, it is possible to find them in broadleaf weeds, especially capeweed. Carefully lifting up the leaves closest to the soil and checking the soil surface for mites can also help, as the RLEM spends 90% of its time on the soil surface rather than on plants.

Figure 7. Red-legged earth mites (RLEM). Photo A. Weeks (CESAR).

Control by insecticide spraying is often required in autumn within one week of pasture germination, or pre-sowing if the presence of the mite was detected then. There are several registered insecticides for RLEM control, such as omethoate at 100 mL/ha, chlorpyrifos at 140 mL/ha and alpha-cypermetrin at 50–100 mL/ha. Read labels before use and be aware that all these products have a witholding period (1–3 days before grazing depending on the product).

In the 3030 Project south-western partner farm, the use of insecticides to protect against RLEM together with any herbicide sprays for pasture was considered standard practice.

RLEM can produce two or three generations in winter and, importantly, the insecticides do not kill eggs. For this reason, populations can increase enough over winter to cause damage again in spring, even when insecticide was applied in the autumn. A strategy to avoid this re-appearance is to kill the first generation of RLEMs in autumn before they lay eggs. The target is to apply the insecticide within three weeks of the first appearance of RLEM. This requires close monitoring of high-risk paddocks.

As an alternative, systemic pesticides can be applied as seed dressing. When the seedling emerges, it contains pesticide that will kill the mites as they consume the growing seedling. The pesticide-treated seed normally protects seedlings for the first 3-4 weeks post germination. The active ingredient to treat the pasture seed is imidacloprid at a rate of 400 mL/100 kg of seed (be careful not to graze until six weeks after sowing). However, if the density of the RLEM is high, the damage can be severe before the pesticide takes effect.

CSIRO research showed that mite control in spring, if accurately timed, can prevent production of over-summering eggs. This strategy is being implemented in Western Australian cropping farms. It was also reported on six different sites in Western Australia that RLEM had become resistant to frequently used synthetic pyrethroids such as bifenthrin.

There are more than 19 natural enemies of the RLEM. Although preserving these populations is difficult to achieve since most insecticides in use are of broad spectrum, there are some insecticide groups with lower impact on natural enemies (ask local agronomists).

On farms where RLEM has been detected in the past but monitoring has not been carried out (e.g. out blocks to be re-sown) the strategy should aim to avoid the risk of attack. Rotation with non-host crops can reduce the colonisation of RLEM. Examples of non-hosts are wheat and barley or some legumes such as vetch and lupins. This strategy can be combined with spring sowing of perennial pastures, when the risk of attacks is lower.

Lucerne flea (*Sminthurus viridis*)

Lucerne flea is an important pest in the establishment of perennial ryegrass. Its life cycle is similar to the RLEM in that the first fleas hatch from over-summering eggs in March-April following autumn rains and go through 3–5 generations between autumn and spring.

The lucerne fleas make characteristic small holes in leaves with the appearance of small ‘windows’ (Figure 8) and this damage can stunt or kill seedlings when the infestations are severe.

Figure 8. Lucerne flea damage on a cereal leaf. (Photo: Agvise Pty Ltd).

After ryegrass germination, the paddock should be monitored weekly, particularly if there have been problems in previous years. Lucerne fleas are often concentrated in patches within a paddock, so it is important to cover the whole area when monitoring.

The control is normally done post-emergence after damage is first detected with an organophosphate insecticide such as dimethoate at 55–85 mL/ha or chlorpyrifos at 70 mL/ha. A follow-up spray may be needed about four weeks after the first spray to kill new lucerne fleas before they lay more eggs.

At the 3030 project partner farms, the lucerne flea monitoring and control was conducted to target both the RLEM and the lucerne flea, since they have a similar life cycle and can show an impact under similar conditions and at the same time of the year. They also can be controlled by the same insecticides in some cases.

Diseases

Rust (crown rust; *Puccinia coronata*)

Crown rust is the most common disease affecting perennial ryegrass production on southern Victorian dairy farms. This fungus lives on live grass plants throughout the year. It needs warm days (12 to 24°C) and dewy nights or rainfall to enter the tissue of the green leaf from where it feeds off the nutrients in the plant cells and vessels. This causes a premature death of the ryegrass leaves.

The reproductive fructifications of the fungus are characteristic round orange pustules (like powder) that appear on the leaf surface (Figure 9).

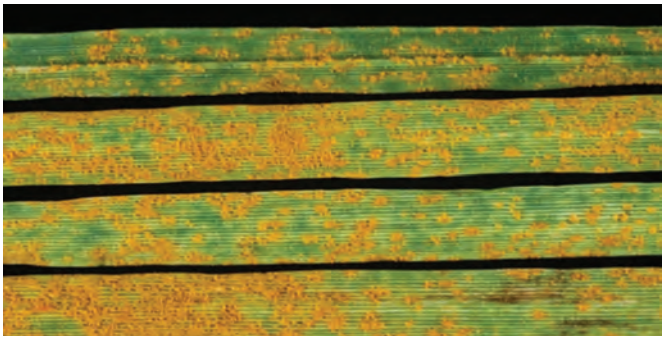

Figure 9. Pustules of crown rust on ryegrass leaves.

The rust can affect perennial ryegrass and milk production by:

- Depleting sugar reserves in the leaf and the whole plant. Studies in Australia (Smith et al., 1998) have reported a significant effect on water soluble carbohydrates. This affected the energy content (digestibility) of pasture, and could also affect root growth and plant survival.
- Lowering palatability of ryegrass by the combined effect of a lower proportion of green leaves and the presence of the fungus fructification (the orange powder or ‘rust’).
- Increased accumulation of pasture litter which can lead to growth of the fungus that causes Facial Eczema.

To reduce the impact of rust on perennial ryegrass production, increase grazing frequency (reduce rotation length). The rust-affected plant maintains fewer live leaves and therefore the target leaf stage for grazing should be reduced. This means grazing at two leaves rather than three or even prior to the second leaf if there is a severe infestation. This reduction in rotation length does not control the rust but reduces its impact on the nutritive value of the feeds harvested by grazing.

An additional strategy to reduce the impact of rust is to apply N. Glasshouse studies (Plummer et al., 1992) have shown that N applications can increase the life of healthy ryegrass leaves (not rust-infected) by about 10%. When N is applied to rust-infected plants, the increase in leaf life can be of as much as 40%. The temperature and humidity conditions needed for the fungus to develop are also suitable for ryegrass growth. So, from a whole farm system perspective, it is likely that the weather would be right for a growth response to N applications.

Another alternative to reduce the incidence of rust on perennial ryegrass production is to select more-resistant cultivars. Although there is a wide range of options, the older cultivars of perennial ryegrass tend to show a higher susceptibility to rust.

Note: These herbicides and insecticides mentioned in this Information Sheet do not represent general recommendations. Seek expert advice, check labels and MSDS, and use as directed. Visit the PestGenie website for more information (http://www.pestgenie.com.au/)

References

Berg (2008) Biology, importance and management of the redheaded pasture cockchafer Adoryphorus couloni. A literature review prepared for GippsDairy Board Inc. Available at: http://www.gippsdairy.com.au/LinkClick.aspx?fileticket=j9SwEkrwQew%3D&tabid=150

Mickan (2008) The redheaded pasture cockchafer. State of Victoria, Department of Primary Industries. Agnote 1358.

Plummer et al. (1992) Effect of leaf age and nitrogen fertilisation on sporulation of crown rust (*Puccinia coronata* var. Mi) on perennial ryegrass (*Lolium perenne* L.). *Annuals of applied biology* 121, 51–56.

Smith et al. (1998) Seasonal variation in the herbage yield and nutritive value of perennial ryegrass (Lolium perenne L.) cultivars with high or normal herbage water-soluble carbohydrate concentrations grown in three contrasting Australian dairy environments. *Australian Journal of Experimental Agriculture* 38, 821–30.

See also

Department of Agriculture of WA Bulletin. Barley grass. Available at: www.agric.wa.gov.au/objtwr/imported_assets/.../weed/.../barleyg.pdfLawrence (2002) Controlling the redlegged earth mite. Pesticide Outlook—December 2002, pages 264–265.

Mickan (2008) The blackheaded pasture cockchafer. State of Victoria, Department of Primary Industries. Agnote 1364.

MurrayDairy (2010) Reducing barley grass in crops and pastures. Available at: www.murraydairy.com.au/_literature.../Barley_Grass_Tech_NoteRoberst and Umina (2008) Lucerne Flea. State of Victoria, Department of Primary Industries. Agnote 0415.

Schroder (1998) Capeweed and Erodium in pastures. State of Victoria, Department of Primary Industries. Agnote 0201.

Umina (2008) Redlegged Earth Mite. State of Victoria, Department of Primary Industries. Agnote 0414.

3030 Project TCC document (2010). Management Factor: Forage Agronomy and Management, pages 1–13.

3030 Project Report from the South West Partner Farm Development Group Meeting (18th August of 2009). Experience on barley grass control.

3030 Project Report from the South West Partner Farm Development Group Meeting (18th February of 2008). Experience on fat hen control.

3030 Project Report from the South West Partner Farm Development Group Meeting (15th June of 2009). Experience on cockchafers.

About 3030

PROJECT 3030 aims to help farmers achieve a 30% improvement in farm profit by consuming 30% more home-grown forage (pasture plus crop). It is aimed at dryland farmers in southern Australia who have mastered the challenge of growing and using ryegrass pasture for dairy-cow feeding.

For further information

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