



## Redlegged Earth Mite

Paul Umina, Centre for Environmental Stress and Adaptation Research, The University of Melbourne.

The redlegged earth mite (RLEM) - (*Halotydeus destructor*) is a major pest of pastures, crops and vegetables in regions of Australia with cool wet winters and hot dry summers. The RLEM was accidentally introduced into Australia from the Cape region of South Africa in the early 1900s. These mites are commonly controlled using pesticides, however, non-chemical options are becoming increasingly important due to evidence of resistance and concern about long-term sustainability.

### Identification & distribution

Adult RLEM are 1 mm in length and 0.6 mm wide (the size of a pin head) with 8 red-orange legs and a completely black velvety body. Newly hatched mites are pinkish-orange with 6 legs, are only 0.2 mm long and are not generally visible to the untrained eye. The larval stage is followed by three nymphal stages in which the mites have 8 legs and resemble the adult mite, but are smaller and sexually undeveloped.

Other mite pests, in particular blue oat mites and the balaustium mite, are sometimes confused with RLEM in the field. Blue oat mites can be distinguished from RLEM by an oval orange/reddish mark on their back, while the balaustium mite has short hairs covering its body and can grow to twice the adult size of RLEM. Unlike other species that tend to feed singularly, RLEM generally feed in large groups of up to 30 individuals.



*Figure 1: Redlegged earth mites (Halotydeus destructor). Photo: A. Weeks (CESAR).*

The RLEM is widespread throughout most agricultural regions of southern Australia. They are found in southern NSW, on the east coast of Tasmania, the south-east of SA, the south-west of WA and throughout Victoria. Genetic

studies have found high levels of gene flow and migration within Australia.

Although individual adult RLEM only move short distances between plants in winter, recent surveys have shown an expansion of the range of RLEM in Australia over the last 30 years. Long range dispersal is thought to occur via the movement of eggs in soil adhering to livestock and farm machinery or through the transportation of plant material. Movement also occurs during summer when over-summering eggs are transported by wind.



*Figure 2: The distribution of the redlegged earth mite in Australia (shaded areas indicate known distribution).*

### Life-cycle & biology

Earth mites are active in the cool, wet part of the year, usually between April and November. During this winter-spring period, RLEM may pass through three (sometimes only two) generations, with each generation surviving six to eight weeks.

RLEM eggs hatch in autumn following exposure to cooler temperatures and adequate rainfall. It takes approximately two weeks of exposure to favourable conditions for over-summering eggs to hatch. This releases swarms of mites, which attack delicate crop seedlings and emerging pasture plants.

RLEM eggs laid during the winter-spring period are orange in colour and about 0.1 mm in length. They are laid singly on the underside of leaves, the bases of host plants (particularly stems) and on nearby debris. They are often

found in large numbers clustered together. Female RLEM can produce up to 100 winter eggs, which usually hatch in eight to ten days, depending on conditions.

Towards the end of spring, physiological changes in the plant, the hot dry weather and changes in light conditions combine to induce the production of over-summering or 'diapause eggs'. These are stress resistant eggs that are retained in the dead female bodies. Diapause eggs can successfully withstand the heat and desiccation of summer and give rise to the autumn generation the following year.

RLEM reproduce sexually, with an adult sex ratio that is female biased. Reproduction occurs when the male RLEM (which is smaller than the female) produces webbing, usually on the surface of the soil. It then deposits spermatophores on the threads of this webbing, which the female mite picks up to fertilise her eggs.

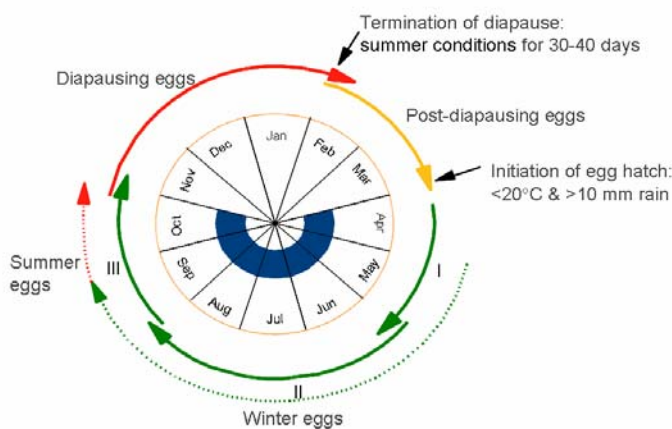


Figure 3: The life cycle of the redlegged earth mite.

## Behaviour & damage

The RLEM is called an earth mite because it spends 90% of its time on the soil surface, rather than on the foliage of plants. The mites feed on the foliage for short periods and then move around before settling at another feeding site. Other mites are attracted to volatile compounds released from the damaged leaves, which results in feeding aggregations.

Typical mite damage appears as 'silvering' or 'whitening' of the attacked foliage. Mites use adapted mouthparts to lacerate the leaf tissue of plants and suck up the discharged sap. The resulting cell and cuticle damage promotes desiccation, retards photosynthesis and produces the characteristic silvering that is often mistaken as frost damage. RLEM are most damaging to newly establishing pastures and emerging crops, greatly reducing seedling survival and development. In severe cases, entire crops may need re-sowing following RLEM attack.



Figure 4: Redlegged earth mite feeding damage results in the appearance of white or silvery patches on plant foliage.

RLEM hosts include pasture legumes, subterranean and other clovers, medics and lucerne. They are particularly damaging to seedlings of all legumes, oilseeds and lupins when in high numbers. They feed on ryegrass and young cereal crops, especially oats. RLEM also feed on a range of weed species including Patersons' curse, skeleton weed, variegated thistle, ox-tongue, smooth cats' ear and capeweed.

RLEM feeding reduces the productivity of established plants and has been found to be directly responsible for reduction in pasture palatability to livestock.

## Monitoring

Carefully inspect susceptible pastures and crops from autumn to spring for the presence of mites and evidence of damage. It is especially important to inspect crops regularly in the first three to five weeks after sowing. Mites are best detected feeding on the leaves in the morning or on overcast days. In the warmer part of the day RLEM tend to gather at the base of plants, sheltering in leaf sheaths and under debris. They will crawl into cracks in the ground to avoid heat and cold. When disturbed during feeding they will drop to the ground and seek shelter.

RLEM compete with other pasture pests, such as blue oat mites, for food and resources. Competition within and between mite species has been demonstrated in pastures and on a variety of crop types. This means control strategies that only target RLEM may not entirely remove pest pressure because other pests can fill the gap. This can be particularly evident after chemical applications, which are generally more effective against RLEM than other mite pests.

## Control

### Chemical control

Chemicals are the most commonly used control option against earth mites. While a number of chemicals are registered for control of active RLEM in pastures and crops, there are no currently registered pesticides that are effective against RLEM eggs.

### Autumn sprays:

Controlling first generation mites before they have a chance to lay eggs is the only effective way to avoid the need for a second spray. Hence, pesticides used at or after

sowing should be applied within three weeks of the first appearance of mites, before adults begin to lay eggs. Timing of chemical application is critical.

1. Pesticides with persistent residual activity can be used as bare earth treatments, either pre-sowing or at sowing to kill emerging mites. This will protect seedlings which are most vulnerable to damage.
2. Foliage sprays are applied once the crop has emerged and are generally an effective method of control.
3. Systemic pesticides are often applied as seed dressings. Seed dressings act by maintaining the pesticide at toxic levels within the growing plant, which then affects mites as they feed. This strategy aims to minimise damage to plants during the sensitive establishment phase. However, if mite numbers are high, plants may suffer significant damage before the pesticide has much effect.

### Spring sprays:

Research has shown that one accurately timed spring spray of an appropriate chemical can significantly reduce populations of RLEM the following autumn. This approach works by killing mites before they start producing diapause eggs in mid-late spring. The optimum date can be predicted using climatic variables, and tools such as TIMERITE® can help farmers identify the optimum date for spraying. Spring RLEM sprays will generally not be effective against other pest mites.

Repeated successive use of the 'spring spray' technique is not recommended as this could lead to populations evolving resistance to the strategy. To prevent the development of resistance, the selective rotation of products with different Modes of Action is advised.

### Biological control

There is evidence of natural RLEM populations showing resistance to some chemicals, therefore, alternative management strategies are needed to complement current control methods.

At least 19 predators and one pathogen are known to attack earth mites in eastern Australia. The most important predators of RLEM appear to be other mites, although small beetles, spiders and ants also play a role in reducing populations. A predatory mite (*Anystis wallacei*) has been introduced as a means of biological control, however, it has slow dispersal and establishment rates. Although locally successful, the benefits of this mite are yet to be demonstrated.

Preserving natural enemies may prevent RLEM population explosions in established pastures but this is often difficult to achieve. This is mainly because the pesticides generally used to control RLEM are broad-spectrum and kill beneficial species as well as the pests. The chemical impact on predator species can be minimised by choosing a spray that has least impact and by reducing the number of chemical applications. Although there are few registered alternatives for RLEM, there are groups that have low-moderate impacts on many natural enemies such as cyclodiene.

Natural enemies residing in windbreaks and roadside vegetation have been demonstrated to suppress RLEM in adjacent pasture paddocks. When pesticides with residual activity are applied as border sprays to prevent mites moving into a crop or pasture, beneficial insect numbers may be inadvertently reduced, thereby protecting RLEM populations.

### Cultural control

Using cultural control methods can decrease the need for chemical control. Rotating crops or pastures with non-host crops can reduce pest colonisation, reproduction and survival. For example, prior to planting a susceptible crop like canola, a paddock may be sown to cereals or lentils to help reduce the risk of RLEM population build up. Cultivation can also help reduce RLEM populations by significantly decreasing the number of over-summering eggs. Hot stubble burns can provide a similar effect.

Clean fallowing and controlling weeds around crop and pasture perimeters can also act to reduce mite numbers. Control of weeds, especially thistles and capeweed, is important, as they provide important breeding sites for RLEM. Where paddocks have a history of damaging, high density RLEM populations, it is recommended that sowing pastures with a high-clover content be avoided.

Appropriate grazing management can reduce RLEM populations to below damaging thresholds, possibly because shorter pasture results in lower relative humidity, which increases mite mortality and limits food resources.

Other cultural techniques including modification of tillage practices, trap or border crops, and mixed cropping can reduce overall infestation levels to below the economic control threshold, particularly when employed in conjunction with other measures.

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