Options for pest management in pastures

Phil Michael
Mike Grimm
Mike Hyder
Peter Doyle

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OPTIONS
for pest management in pastures

Redlegged earth mite, blue oat mite, lucerne flea and aphids damage pastures across southern Australia, and it has been estimated that they cause annual losses to the Australian wool industry alone of over $200 million. Redlegged earth mite is without doubt the most serious of the four pests. Phil Michael, Mike Grimm, Mike Hyder and Peter Doyle discuss integrated management options to control these pests.

Until now it has been difficult for farmers to assess whether pests are likely to damage their pasture. Current work is showing that losses due to these pests are largely dependent on patterns of pasture use in a paddock and may vary from negligible to several tonnes per hectare.

While long term solutions are being developed for managing the major pasture pests, available methods must be refined and used to maximum effect. The highly effective, but short term, result of pesticide spraying is frequently observed by producers. However, many would be unaware that grazing management is also causing marked changes in the numbers and impact of the pests.

Pest management options
There are four main strategies for pasture pest management; two of which are long-term solutions while the other two affect pest numbers almost immediately.

Pasture pest management – the options

Future
- When they become available, planting varieties resistant to pests like aphids and redlegged earth mite.
- Spreading biological control agents and maximising their effectiveness through management.

Effective now
- Employing grazing management over part of the farm to reduce pest numbers.
- Applying pesticide to those paddocks where pest activity will result in economic damage.

Resistant varieties and predators
The two longer-term strategies being pursued for reducing the impact of these pests involve resistant varieties and predators. If successful, these would be self-perpetuating and compatible; making the ideal basis for pest management. They would reduce our reliance on repeated chemical control measures which, apart from being a less desirable option, is likely to select pests which are resistant to chemicals.

A promising and high priority area of work is the identification of pasture legumes which are resistant to redlegged earth mite. Screening has identified varieties that are resistant to this pest and show much less damage at both the seedling stage and as older plants. There are plans to release varieties with a high degree of resistance within a few years.

Further into the future, resistance mechanisms will probably be identified and resistance genes will then be transferred more easily into agronomically suitable varieties.

(Top) Typical silverying of leaves caused by redlegged earth mite feeding. Note the mites clumped together.

(Left and insert) Redlegged earth mite and lucerne flea on clover showing typical damage. Redlegged earth mite sucks juices from the plant but lucerne flea eats the leaf tissue, leaving characteristic ‘windows’ in the leaf.
Apart from many natural enemies of aphids, effective predators are present in Australia which specifically target lucerne flea, redlegged earth mite and blue oat mite.

The pasture snout mite is present in most areas and helps to suppress lucerne flea numbers. This orange mite with a pointy head is often seen under pieces of wood or bark.

Two further predators were introduced from overseas. The spiny snout mite is a more effective predator of lucerne flea and is successful in areas where the pasture snout mite fails to survive. The French anystis mite is an effective predator of redlegged earth mite, blue oat mite and lucerne flea.

Because these predators have no means of spreading rapidly on their own and are limited in their distribution, a network of new colonies was started by Agriculture Western Australia in recent years to help speed the process. The Meat Research Corporation and International Wool Secretariat supported this work which also determined the effectiveness of these predators.

While they do not provide the same level of control as chemicals, they reduce pest numbers and increase pasture legume yields as shown in recent experiments on ungrazed pastures (see Figures 1 and 2).

The predators are not greatly affected by commonly used pesticides but their numbers are considerably reduced by grazing to low pasture levels. Because they spread so slowly, their usefulness will only be realised if they are established on each property. They would need to be collected and redistributed by farmers wishing to establish them; producers in an area could cooperate by establishing colonies and managing them so that maximum numbers could be produced for redistribution.

**Grazing management**

Ongoing work being conducted under the Wool Products Program of Agriculture Western Australia, supported by the Meat Research Corporation, is showing that pest populations are greatly reduced by grazing, sometimes to an extent
Feed on offer is controlled by varying stocking rate. The area left of the fence was grazed to 1.4 tonnes per hectare and had low numbers of pests, to the right of the fence was stocked at 12 sheep per hectare and was heavily infected.

That is more effective than chemical spraying. A large experiment designed to determine the effects of different grazing strategies on the pests and on animal production is in progress.

In this experiment, which is repeated at three sites (Mt Barker, South Stirlings and North Dandalup), set stocking at the district average rate is compared with grazing to two defined levels of green pasture, 1.4 and 2.8 tonnes per hectare. These levels of feed (feed on offer or FOO) are maintained by adding and removing animals as necessary; the pasture above these levels is eaten as it is produced.

Maintaining 2.8 tonnes per hectare of green matter is suitable for growing animals, especially pregnant and lactating ewes (note: the 2.8 tonnes is expressed on a dry weight basis, this would equate to about 20 tonnes of fresh pasture). With a FOO of 1.4 tonnes per hectare wethers will at worst maintain weight, and usually gain weight. The tighter grazing pressure may also help in reducing micron and maintaining a more even fibre, usually with improvements in staple strength.

To determine the effect of pests, each of these grazing treatments is duplicated so that there are areas with pests and areas where pests are removed by spraying. Feed levels at the South Stirlings site in 1994 are shown in Figure 3.

In paddocks with set stocking where pasture growth is outstripping consumption, pests will increase to damaging numbers and may decrease pasture production for the season by up to 4 tonnes per hectare (Figure 4). The pests become more damaging as the grazing pressure is reduced. A similar effect could be expected in paddocks locked up for hay or silage production.

In excellent seasons, when feed gets away from the animals and accumulates to 5 tonnes per hectare or more under set stocking, subterranean clover densities may be greatly reduced, especially without pest control, compared with areas grazed to lower FOO levels (Figure 5).

Grazing to 1.4 and 2.8 tonnes per hectare through spring controls pests, particularly redlegged earth mite (Figure 6) and spraying is not required. Under controlled grazing, spraying does not increase the total amount of pasture grown or the amount of grazing and animal production. The effect of other grazing strategies such as rotational grazing have not been investigated but any form of intensive grazing is likely to have a large impact on pest numbers.

If pests are controlled in spring through grazing or effective spraying, lower numbers will be present in the following season, as shown in Figure 7, so that pastures or crops will be free of serious damage. This is because autumn/winter populations result from eggs formed in the previous spring.

Figure 3. Green feed levels through spring at South Stirlings in 1994.
There may be as many as 250,000 individual insects or mites in a square metre of pasture. Most of these are beneficial species involved in the recycling of plant material and nutrients and their numbers are dependent on the quantities of dead organic matter available.

Although their numbers are affected by grazing and spraying, these effects are short lived and numbers return when sufficient dead organic matter appears. After spraying, certain species frequently increase in number to take the place of others which have been reduced by the spray.

Under the controlled grazing strategies many more animals can be run in the paddock as a much greater proportion of the pasture is used at the time of year when its quality is high. In medium and high rainfall sites, up to twice as much liveweight gain and four times the wool, with finer and stronger wool, may be produced on those parts of the farm where controlled grazing is practised.

The question now is how to incorporate these grazing strategies into whole farms, where there are not sufficient stock to graze all paddocks to the low levels at which pests are controlled and feed utilisation is more efficient. Extra feed produced is of greatest value if conserved as high quality silage or hay.

In a project started in February 1995, feed profiles and feed budgets are being measured on two farms at Kojonup and Porongorup. Estimates are being made every three weeks of available feed and of pasture growth rate, so that grazing plans can be developed using the information from these experiments. Farmers attending field days at these sites are gaining experience in estimating the quantity of available feed over the whole farm.
Deciding on chemical control

Pest management is based on the ability to decide whether pests are likely to cause economic damage. It may be necessary to count the number of pests, to observe the amount of damage they are causing or to somehow determine the risk of serious damage occurring.

Counting pasture pests is impractical, because of their small size, therefore techniques for rating pest damage are being tested. A simple yes/no decision on the presence of pest damage to legumes, observed through holes (8 centimetre diameter) in a mat provides a good indication of likely economic effects. Chemical control is warranted if damage is repeatedly observed in one or more of the five holes.

Helpful predictions of likely pest damage are now possible by assessing the risk of damage and especially by a consideration of the effects of grazing and spraying practices (see table).

Autumn control of redlegged earth mite and lucerne flea is likely to be uneconomical if pest numbers have been very low in the previous spring due to grazing or chemical control.

Emerging pastures are very sensitive to pest attack and chemical control is likely to be worthwhile if pastures were not well utilised during the previous spring. Mass hatching of redlegged earth mite occurs after a week of cool weather with maximums under 21°C and rain. Lucerne flea hatches with soaking rains.

Protection is needed for legumes germinating after these events especially if they are sown into existing pastures or if legume densities are low. Chemicals with a contact action should be used if there is little or no green material present.

Spring control is not likely to be worthwhile if pastures are growing vigorously and they are being grazed below 2.5 tonnes per hectare. In years of excess feed when pasture will not be consumed while its quality is high, spraying is not warranted just to produce more feed, but it may be considered if the legume content needs to be preserved or improved. Spraying will often be of benefit in the production of hay or silage as pests will usually reduce the yield and quality of locked up paddocks.

Effective chemical control in spring will not only result in increased pasture and seed yields, but will benefit emerging pastures (or crops) in the following season. Control in late spring only will not be as effective in preventing pests from bridging the gap between seasons, because some of the eggs that survive over summer will have already formed. This process begins as temperatures rise and pastures are beginning to flower in late winter or spring.

Because none of the registered chemicals kills the pest eggs, they are likely to provide only short term protection if they are applied once. Two effective sprays applied 14 to 21 days apart in spring or
Autumn will give prolonged effects especially for redlegged earth mite.

**Resistance of pests to chemicals**
Ineffective chemical treatments may be the result of a number of factors. Poor application of chemicals or poor spray timing may result in less than full control. Mistresses may not provide effective control as they must be used under ideal conditions. The reappearance of pests after spraying may be due to the short life of currently used chemicals and the fact that these chemicals are ineffective against the eggs. However, there is increasing evidence of resistance to chemicals in the redlegged earth mite and farmers are encouraged to report a lack of control where all other factors have been discounted.

Judicious use of insecticides, and use of grazing strategies, should reduce the risk of resistance occurring. In the medium to long term, development of resistant clover varieties and increased spread of natural enemies should further reduce requirements for spraying.

The main criteria for deciding on chemical control are shown in the table below.

<table>
<thead>
<tr>
<th>Season</th>
<th>Situation</th>
<th>Control option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn/winter</td>
<td>Previous spring pastures with high grazing pressure and grazed below 2.5 tonnes per hectare or pests were controlled effectively with chemicals; legume seed bank adequate; good legume density with little pest damage evident.</td>
<td>No need to spray</td>
</tr>
<tr>
<td></td>
<td>More than 3 tonnes per hectare of pasture and low grazing pressure in previous and pests not controlled; improvement in legume density and seed set required; legumes germinating after a week of cool weather; pest damage appearing.</td>
<td>Spray at germination followed by a second spray 2 to 3 weeks later to kill all young pests hatching from summer eggs or one spray 3 to 4 weeks after break.</td>
</tr>
<tr>
<td></td>
<td>Improvement in legume density and seed set required; mild weather with over 1.5 tonnes per hectare of pasture; aphids present.</td>
<td>May require aphid spray in occasional year and could replace mite spray.</td>
</tr>
<tr>
<td>Spring</td>
<td>Excess of pasture which will not be used when quality is high in early summer; high proportion of legume and adequate seed bank.</td>
<td>No need to spray.</td>
</tr>
<tr>
<td></td>
<td>Grazing pressure high and feed maintained below 2.5 tonnes per hectare; little pest damage evident.</td>
<td>No need to spray unless feed levels increase.</td>
</tr>
<tr>
<td></td>
<td>Grazing pressure low and feed levels above 3 tonnes per hectare and will be utilised while quality is high or conserved; improvement in seed set required; pest damage appearing or aphids found.</td>
<td>Spray at early flowering followed by a second spray 2 to 3 weeks later to kill all stages and prevent formation of summer eggs or one spray at mid flowering.</td>
</tr>
</tbody>
</table>

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Phil Michael is located at South Perth and can be contacted on (09) 368 3752 and Mike Grimm and Mike Hyder are located at Albany and can be contacted on (088) 42 0500.