A TIMERITE® issue: testing importance of spray timing

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Introduction

Redlegged earth mites are major pests of clover seedlings in annual legume pastures in autumn at the break of season. TIMERITE® provides the farmer with a spray date in spring for optimum control of redlegged earth mites that is specific for their farm.

For a short time in spring, after the mites have finished laying winter eggs but before they start developing the oversummering diapause eggs, there are no eggs present. This is the ideal time to spray, as eggs are impervious to sprays. Controlling mites in this period prevents the production of diapause eggs and so the emergence of mites in the following autumn.

With TIMERITE®, the window of opportunity for spraying is only three days on either side of the recommended date; and many farmers have indicated that they need a longer period. Such issues as bad weather or a large spray area may prevent spraying at the appointed time.

The team from CSIRO Entomology who developed TIMERITE® set out to quantify the affect on legume density and mite control in the following autumn of spraying outside the recommended window. At the same time, they looked at whether the choice of persistent or non-persistent chemicals made any difference to mite control in both spring and autumn.

Methods

Two grazed sub clover sites that had not been sprayed for several years were selected in each of two regions of southwest Western Australia. The two regions had different climates and predicted spray dates, but the two sites within each region had similar climates and spray dates.

The efficacies of two commonly used compounds, omethoate and dimethoate, were compared. While both are systemic insecticides, omethoate is more persistent than dimethoate. The sites at Gingin (central) and Mount Barker (south) were sprayed with omethoate and the sites at Bakers Hill (central) and Porongurup (south) were sprayed with dimethoate. Mites were sampled before spraying to estimate abundance and two weeks after spraying to assess efficacy of spray.

The following autumn, mite samples were collected from each treatment, and the number of emerging sub clover seedlings were assessed to determine any effects on pasture legume content of the different spray times.

To test the accuracy of the TIMERITE® model in predicting the date of 90% diapause, mites were collected on each sampling occasion; and from each sample, 100 adult females were dissected in the laboratory and the proportion of diapause eggs inside each was determined.

Results

Spring data, 2000

In the spring of 2000, mite populations in the control plots increased over the six weeks of the measurements and were greatest at the Porongurup site (Table 1). Short-term mite control when sprayed two weeks before the optimum date in spring was over 93% on all but one occasion at Bakers Hill where it was 53% (Table 2). Two weeks after spraying two weeks late, the pasture had senesced. At Porongurup and Mt Barker, no mites were seen, while at Gingin and Bakers Hill, mite numbers were very low. Percent control measured at this time may therefore not be a true indication of insecticide control (Table 2).

Age of mites was determined two weeks after the spray. At Bakers Hill, there were large numbers of young mites following spraying two weeks early. This is consistent with eggs hatching following control of active mites with spray. It implies that large numbers of winter eggs were present on pasture at the time of spraying. Gingin was the only site where mature mites were present after spraying, indicating that the spray was not completely effective in killing all the mites on these two occasions.

Table 1. Prespray sample: Populations of redlegged earth mites (mites/m^2) prior to insecticide application in spring.

Site	2 weeks early	Optimum date	2 weeks late
Gingin	29,003	26,326	75,634
Bakers Hill	35,092	63,243	63,898
Mt Barker	1,305	29	9,387
Porongurup	71,301	174,084	403,440

Table 2. Postspray sample: Control of redlegged earth mites measured two weeks after a spray application.

		Reduction 2 weeks after insecticide application		
Site	Chemical	2 weeks early	Optimum date	2 weeks late*
Gingin	Omethoate	98%	93%	99.89%
Bakers Hill	Dimethoate	53%	99.98%	100%
Mt Barker	Omethoate	95%	100%	No mites
Porongurup	Dimethoate	99.97%	100%	No mites

*Pastures had senesced.

Diapause data, 2000

The actual date of 90% diapause occurred several days early at three of the four sites and on the exact day at the remaining site (Table 3). At the southern sites, and particularly at the Porongurup site, a substantial proportion of eggs were diapause eggs at the optimum spraying date (70%). However, at the other sites, the proportion of diapause eggs at the optimum spraying dates was very low.

Table 3. Predicted and actual dates of 90% diapause at window of opportunity trial sites in Western Australia, spring 2000.

Site	Predicted date 90% diapause	Observed % diapause	Actual date 90% diapause	Difference (days)
Gingin	3 October	91%	3 October	0
Bakers Hill	5 October	95%	4 October	-1
Mt Barker	16 October	93%	13 October	-3
Porongurup	19 October	93%	12 October	-7
Mean				-2.7

Autumn data, 2001

The following autumn, percentage control (compared to unsprayed treatment) was high at the Gingin, Mt Barker, and Porongurup sites sprayed 2 weeks early and on the optimum date but was poor when sprayed two weeks late (Table 4). At Bakers Hill, numbers were lower in treatments sprayed two weeks early and on the optimum date but not in the area sprayed two weeks late (Table 4).

Table 4. Control of redlegged earth mites counted in autumn 2001 following a single spray in spring 2000.

		% Reduction		
Site	Chemical	2 weeks early	Optimum date	2 weeks late
Gingin	Omethoate	94	98	51
Bakers Hill	Dimethoate	25	31	-28
Mt Barker	Omethoate	100	100	20
Porongurup	Dimethoate	94	82	50
Mean		78	78	23

The seedling data showed very similar trends (Table 5). The average percentage increase in seedling numbers across all sites was high in areas sprayed two weeks early and on the optimum date but very low when sprayed two weeks late (Table 5).

Table 5. Increase in emergent sub clover seedlings following a single spray in spring 2000 compared with unsprayed area (mean seedlings/m^2).

	2 weeks early		Optimum date		2 weeks late	
Site	Increase (No./m^2)	% Increase	Increase (No./m^2)	% Increase	Increase (No./m^2)	% Increase
Gingin	2,406	253	3,573	376	119	13
Bakers Hill	-238	-11	1,163	52	438	20
Mt Barker	2,636	58	2,114	47	-3,875	-86
Porongurup	234	32	17	2	565	77
Mean	1,260	83	1717	119	-688	6

Discussion

The window of opportunity trials provided clear results. Mite control the following autumn was good when the spring spray was applied at the optimum date or two weeks early but not when applied two weeks late. Dimethoate was not as effective as the more residual omethoate. At the sites using dimethoate (Bakers Hill and Porongurup), average control in autumn for plots treated two weeks early or at the optimum time was lower (58%) than for the two sites where omethoate was used (98%). At Bakers Hill, when sprayed two weeks early, there were very high numbers of winter eggs observed on the pasture; and as dimethoate has limited residual effect, the progeny hatching out over the next couple of weeks would probably not have been killed, resulting in the observed low level of control when sampled two weeks later and also in autumn. At Porongurup, over half the eggs were in diapause at the optimum time for spraying, but there was still 82% mite control the following autumn. There was poor control when spraying two weeks late.

These data show that, for farmer's to achieve good reglegged earth mite control and increased sub clover density, their best option would be to use a systemic, residual chemical applied within a two-week period leading up to and including their optimum spray date from the TIMERITE® database. Spraying after the optimum date with either chemical will not result in good control the following autumn.

The winter growth and persistence of tall fescue under continuous sheep grazing in central western Victoria

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Introduction

Tall fescue (*Festuca arundinacea* L.) is a widely adapted grass species originating from Western Europe. The ability of this grass to tolerate drought, heat, some insect pests, salinity, and waterlogging helps make it a useful species in Australian pasture.

Ecotypes and cultivars of tall fescue can be characterised according to their winter-dormant or winter-active growth habit. While the summer-active tall fescues originate from northern European environments, the winter-active (generally summer-dormant) tall fescues originate from the Mediterranean region. Summer-active northern European types of tall fescue have been widely used on the northern tablelands of New South Wales. Such summer-active tall fescue has been able to utilise the summer rainfall in northern New South Wales. Since the release of cultivar Demeter by CSIRO in 1965, tall fescue has been widely used for pasture in southeastern Australia.

Field trials conducted at Hamilton by Reed (1987) indicated the potential value of winter-active Mediterranean tall fescue for cool-season herbage production in Australia. Anderson *et al.* (1999) found that the winter production of winter-active tall fescue, Melik Select, the prototype of the new cultivar Fraydo, significantly exceeded that of Demeter at Balmoral. Balmoral has a short grazing season and does not favour summer-active tall fescue cultivars, such as Demeter. A further study was conducted at Balmoral to compare the winter productivity, following a moisture-stressed summer–autumn, of contrasting tall fescue