Figure 1. The infestation of six-spotted mite in grapevines can be very patchy as seen here in a row of Chardonnay grapevines in the Karridale region of Western Australia, 6 April 2009.

Update on six-spotted mite in Western Australian vineyards

Stewart Learmonth[1] and Mark Stanaway[1]

Six-spotted mite (SSM) (*Eotetranychus sexmaculatus*) continues to be a cause for concern in Western Australian vineyards, albeit in only a few of them. During the 2008-09 season, two commercial vineyards in the Pemberton region experienced extensive infestations and a very localised infestation was observed in one vineyard in the Karridale region (southern Margaret River). The mite was also present in the experimental block of vines at the Department of Agriculture and Food's (DAFWA) Research Institute in Manjimup.

Studies were carried out in the Pemberton vineyards to enhance our understanding of the mite, including how best to manage its abundance and its effect on the vines.

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Table 1. Miticides assessed for control of six-spotted mite in vineyards.

Miticide A.I.	Product (%AI)	Rate (/100L)	WHP (days)
paraffinic oil	Biopest paraffin oil (81.5%)	1L	1
propargite	Omite (30%)	200g	14 (NZ)
tebufenpyrad	Pyranica (20%)	50g	14 (apples, pears, peaches)
sulfur	Thiovit Jet (80%)	500g	not required
dimethoate	Rogor (40%)	75ml	7
etoxazole	Paramite (11%)	35ml	21 (tablegrapes)
fenbutatin oxide	Torque (55%)	40ml	14 (tablegrapes)
bifenazate	Acramite (48%)	65ml	14 (tablegrapes)

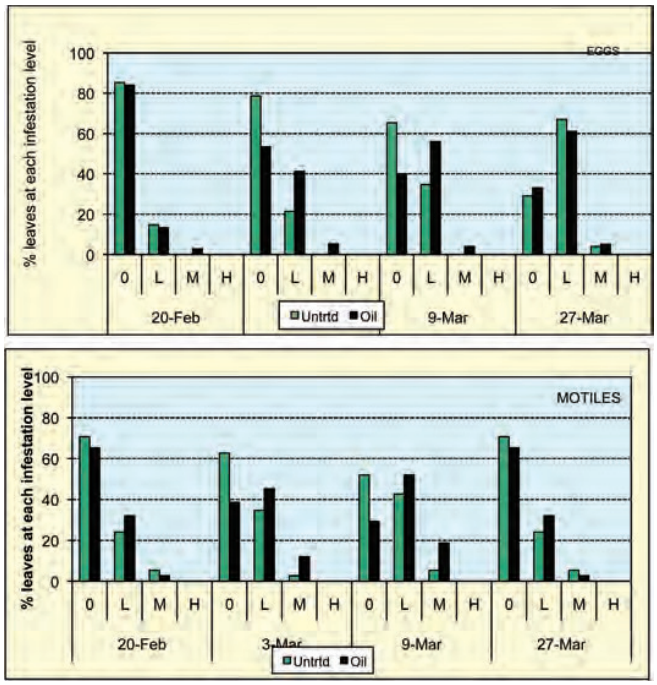

Figure 2a. Abundance of six-spotted mite eggs and motiles on leaves of Shiraz grapes sprayed with Biopest paraffin oil on 27 February 2009. See text for explanation of abundance categories.

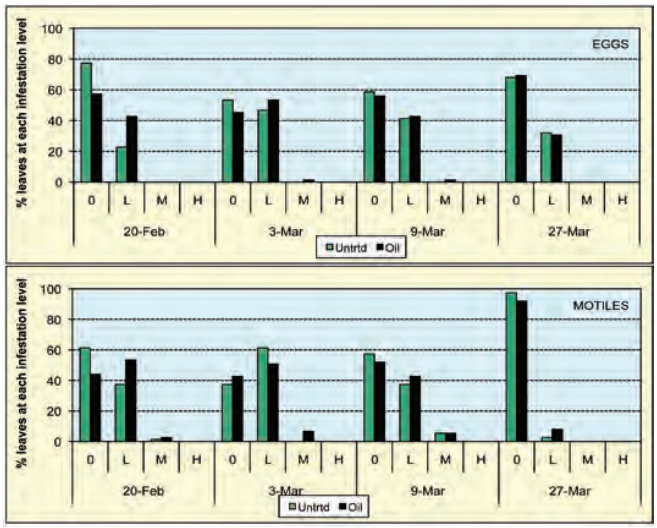

Figure 2b. Abundance of six-spotted mite eggs and motiles on leaves of Verdelho grapes sprayed with Biopest paraffin oil on 27 February 2009. See text for explanation of abundance categories.

Observations in the 2008-09 season

Two commercial vineyards in the Pemberton region that were heavily infested with SSM in the 2007-08 season were kept under surveillance last season. We monitored leaves with the aid of a microscope to confirm whether the mites would reappear and, if so, to identify the timing of the start of the infestation. Despite regular monitoring, the presence of the mite was confirmed first by actually sighting leaves in the field that had the characteristic symptoms of the mite's feeding (Fisher & Learmonth 2006). This occurred in mid-February 2009 in one of the vineyards which subsequently became very heavily infested. In the second vineyard, no evidence of SSM was observed during the season.

The reason for the absence of SSM in the latter vineyard might be explained by the presence of a high population of natural enemies recorded there at the end of the 2007-08 season (Learmonth & Stanaway 2008). In fact, before complete senescence, SSM numbers had all but disappeared in this vineyard. To contradict this theory, the same situation occurred at the DAFWA research block and SSM was also present again in the 2008-09 season in numbers high enough to visually affect leaves.

After the detection of the arrival of SSM in the Pemberton commercial vineyards in the 2008-09 season, a number of studies were conducted to determine if mite numbers could be reduced and so avoid premature loss of leaf function. These studies consisted of applying horticultural spray oils, miticides and the release of predatory mites. In one case, because the distribution of SSM can be very patchy (Figure 1 - see page 59), a sample of grapes from SSM-affected Pinot Noir vines and another sample from adjacent, apparently undamaged vines were compared at vintage for their Baumé. The grape juice in the vines visibly affected by SSM was around 1 Baumé less than apparently healthy vines.

Management of SSM – sprays

The miticides that were assessed for their efficacy against SSM in vineyards during the 2008-09 season are listed in Table 1. Apart from the oil, all miticides were applied only after vintage.

These miticides were assessed both in an unreplicated small plot demonstration on DAFWA's research plot of Chardonnay and over larger areas on a commercial vineyard. For the small plot study, miticides were applied by hand using a backpack sprayer, while on the commercial vineyard miticides were applied by a commercial sprayer. In all cases the target volume of spray solution was 500L/ha. The effect of the miticides was compared with untreated areas of vines and assessed on the abundance of SSM eggs and motiles on leaves. SSM presence on leaves was scored as one of four infestation levels on each of three fields of view (25mm diameter using 10X eyepiece and 0.8X objective) under a binocular dissecting microscope. The infestation levels were: 0 = no mites; L (low) = 1 to 5 mites/field; M (medium) = 6 to 25 mites/field; H (high) = >25 mites/field. Results of the demonstration studies are given in Figures 2a, 2b, 3 (page 62), 4 (page 62) and 5 (page64).

The efficacy of the horticultural spray oil Biopest, a parrafin product, gave mixed results with overall poor performance. The oil gave some level of control in the small area backpack-applied spray trial (see Figure 3), but gave little control in the commercial sprayer-applied demonstrations (see Figures 2a, 2b and 5).

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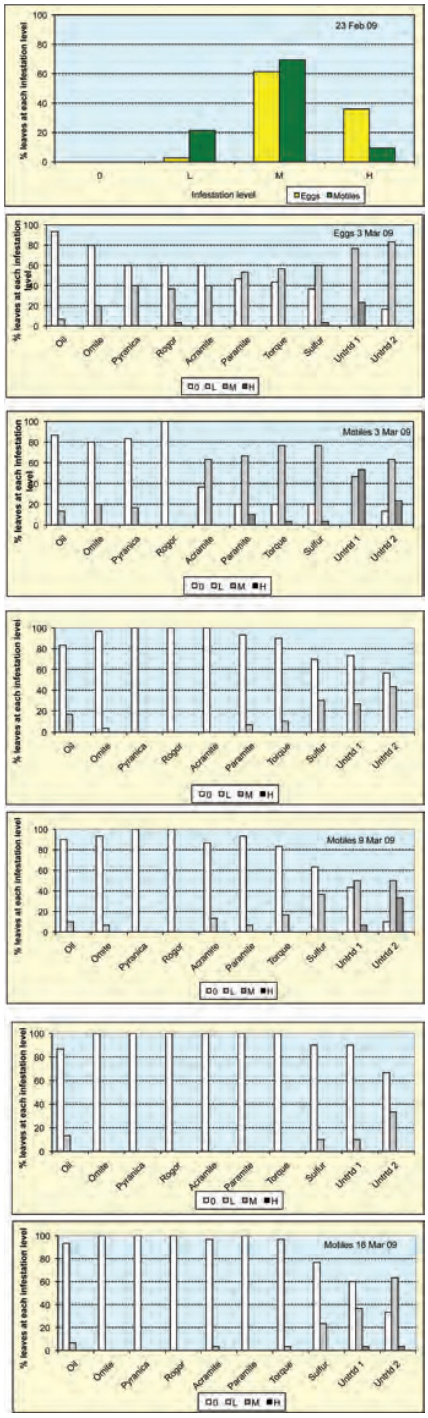

Figure 3. Abundance of six-spotted mite eggs and motiles on leaves of Chardonnay grapes sprayed using a backpack sprayer with miticides listed in Table 1 on 26 and 27 February 2009 (Rogor only). The first sample was a composite one taken across the demonstration area. See text for explanation of abundance categories.

The efficacy of sulfur against SSM was assessed only in the small-scale backpack-applied trial where it performed poorly (see Figure 3).

Of the other miticides tested in the small-scale trial (Figure 3), Rogor gave rapid control of motiles, while the other miticides gave some level of control. After Rogor, Omite and Pyranica seemed to give more rapid control compared with the other miticides, but Acramite, Paramite and Torque all demonstrated some level of activity against SSM. Based on these results and the fact that Omite is registered for use on New Zealand grapevines for control of two-spotted mite, further trial demonstrations of Omite and Pyranica were conducted on a commercial vineyard.

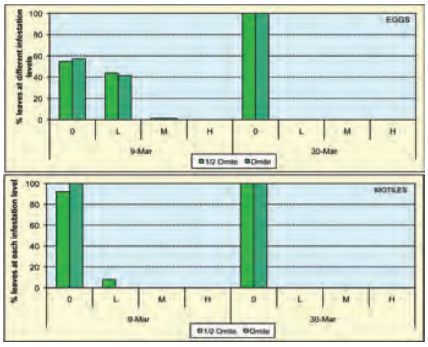

Figure 4. Abundance of six-spotted mite eggs and motiles on leaves of Pinot Noir grapes sprayed with Omite at the label rate (200g/100L) and half this rate on 6 March 2009. See text for explanation of abundance categories.

Both Omite and Pyranica gave consistent control of SSM in the commercial vineyard (see Figures 4 and 5). For both products, half label rates were effective in reducing the abundance of SSM. Both products have a reputation for compatibility with preservation of predatory mites.

Management of SSM – predatory mites

Previous observations on SSM in grapevines have shown that naturally occurring predatory mites build up in the presence of SSM, albeit too late to prevent outbreaks of SSM and consequent leaf damage (Learmonth and Stanaway 2008). To determine whether predatory mites species available in mass rearing facilities in eastern Australia have a role to play in managing SSM, two species were introduced for release into small areas of an infested commercial vineyard.

The predatory mites *Galendromus occidentalis* and *Metaseiulus* (near) *wearnii* were available from mass rearing facilities in South Australia and Queensland. Releases of predatory mites were made in two blocks in a commercial vineyard, including a

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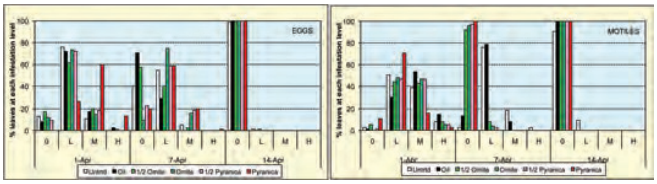

Figure 5. Abundance of six-spotted mite eggs and motiles on leaves of Chardonnay grapes sprayed with Omite at the label rate (200g/100L) and half this rate and Pyranica at the label rate (50g/100L) and half this rate on 2 April 2009. See text for explanation of abundance categories.

Chardonnay and a Merlot block. Predatory mites were received on leaves that were placed in open mesh bags and tied to the vine canopy. Mites were placed amongst 12 panels of vines in adjacent rows that were the central rows of six row plots. Consignments of *G. occidentalis* (Go) were released on 20 February and 19 March 2009. Releases of *Metaseiulus* (near) *wearnii* from both South Australia (WS) and Queensland (WQ) were made in nearby rows to the releases of *G. occidentalis* on 19 March and 2 April 2009.

The presence of SSM eggs and motiles and predators, including the predatory beetle *Stethorus sp.* and predatory thrips, as well as predatory mites was assessed on leaves in the predatory mite release rows. The central two of six rows adjacent to the release rows in each of the two release blocks were monitored to assess the abundance of naturally-occurring predators. Monitoring of the WS and WQ areas did not commence until early April because of the

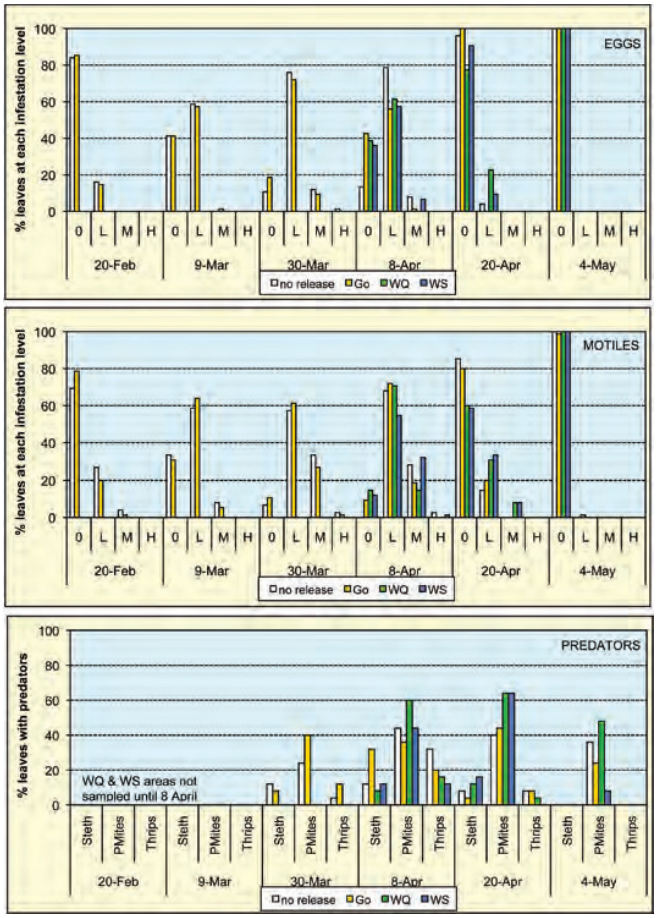

Figure 6. Abundance of six-spotted mite eggs and motiles and predators on leaves of Merlot grapevines where predatory mites were released. See text for explanation of SSM abundance categories and release dates for the predatory mites. Predators recorded were Steth = *Stethorus sp.* beetles, PMites = predatory mites, Thrips = predatory thrips. For explanation of Go, WS, WQ, see text.

later availability and consequent release time for this species. The results of this monitoring in the two vineyard blocks where predatory mites were released are given in Figures 6 and 7 (see page 66). Predators were either absent or present in low numbers until late March. After this time, all three groups of predators were present in both areas but with greater abundance in the Merlot block. Predatory mites were most abundant in the Chardonnay block in the Go release area. Also in this area, SSM appeared to be least abundant in the Go release area in early April. Predatory mites were generally more abundant across all areas in the Merlot block, including the non-release area. There did not appear to be any difference in the abundance of SSM across these areas in the Merlot block. Clarification of the role of predatory mites relies on the identification of mites retrieved from the field and follow-up monitoring of the release and non-release areas in the 2009-10 season.

Conclusions and future studies

As experienced last season, six-spotted mite continues to be a threat to vineyards in the lower southwest of Western Australia. Infestations of mites can cause premature loss of leaf function that affects the ability of the vine to ripen grapes (Figure 8).

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Figure 8. In the middle distance, two rows of Shiraz with green leaves had been sprayed with Omite on 6 March 2009. Photograph taken 7 April 2009.

Studies during the 2008-09 season have shown that horticultural spray oil provides poor and inconsistent control of SSM. While it appeared that predatory mites may help reduce SSM numbers, the effect was small and inconsistent. The most reliable means of managing SSM appears to be through the use of the relatively natural enemy-friendly miticides Omite and Pyranica, which can reduce SSM numbers at half the label rate. As Omite is already registered for use on New Zealand vineyards, this miticide is of further interest to develop for protecting Western Australian vineyards.

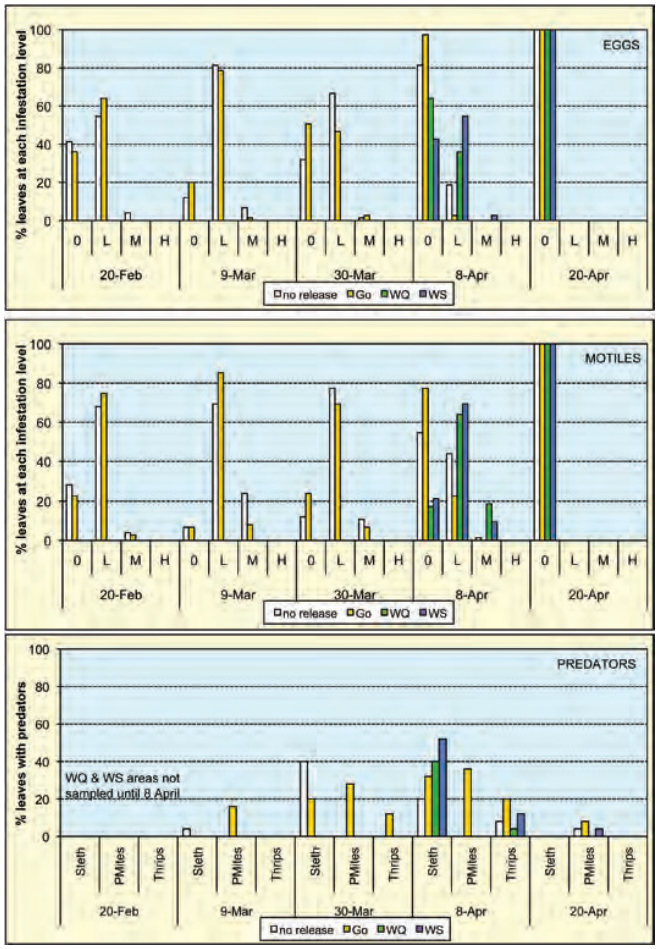

Figure 7. Abundance of six-spotted mite eggs and motiles and predators on leaves of Chardonnay grapevines where predatory mites were released. See text for explanation of SSM abundance categories and release dates for the predatory mites. Predators recorded were Steth = *Stethorus sp.* beetles, PMites = predatory mites, Thrips = predatory thrips. For explanation of Go, WS, WQ, see text.

Acknowledgments

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Further reading

Fisher, D.L. and Learmonth, S.E. (2006) Six-spotted mite, Farmnote 146, Department of Agriculture and Food WA, 4.

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