

Higher sulphur rates improve powdery mildew control

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Sulphur is the main fungicide used to control powdery mildew of grapes throughout the world. Several types of sulphur formulations are used on crops but in Australia wettable sulphur is the main formulation used on vines. In some areas in Australia as well as overseas, dusting formulations are also applied to vines.

Most formulations of wettable sulphur contain an 80% active ingredient of sulphur and recommended rates of use range from 100g to 300g per 100L of water or 2 Kg to 3Kg per Ha.

In recent years there have been many reports of poor control of powdery mildew when sulphur has been used at the 100 to 200g/100L rate. This has been confirmed in several trials where programs with only sulphur sprays were less effective than those that included other fungicides such as penconazole Topas[®] in the program (Table 1).

For many years in some grape growing areas of Australia, particularly those in cooler climates, some growers have used double and in some cases treble rates of wettable sulphur, ie. 600g/100L or 6Kg/Ha, early in the season to compensate for poor sulphur activity at low temperatures. These higher rates are more consistent with rates of wettable sulphur used on vines overseas. The reason why low rates have been recommended in Australia compared to those used overseas is unknown, but it may have been because of phytotoxicity caused by some sulphur formulations used in the past.

We conducted experiments to determine the efficacy of higher rates of sulphur and to see if the use of the higher rates caused burning on bunches or leaves.

A number of trials were carried out at Lenswood in the Adelaide Hills, at Nuriootpa in the Barossa Valley and at Loxton in the Riverland district in the 2000/2001 season. In these trials one of the widely used formulations of wettable sulphur (Thiovit[®]) was applied to mature Chardonnay vines at either 300g, 600g or 1.2 Kg/100L of spray.

Sprays were applied on 5 to 7 occasions between October 2000 and January 2001 using a Solo hand mist sprayer at Lenswood and commercial air blast sprayers at the other sites. Spray volumes of up to 900L/Ha were applied with both mist and air blast sprayers. At Lenswood the different rates of

wettable sulphur were also applied to vines of Sauvignon Blanc on six occasions, using an air blast sprayer and volumes of 1000L/Ha.

Wettable sulphur was also applied to vines of Sauvignon Blanc at Lenswood and to Shiraz at Nuriootpa in January 2001 when ambient temperatures of 40°C occurred during and immediately after spraying.

Assessment of powdery mildew in February 2001 showed that at the Loxton and Lenswood sites, improvements in powdery mildew control were obtained where the higher rates of wettable sulphur were applied in a full sulphur program (Figure 1 and 2). At Nuriootpa, the incidence of powdery mildew was low and variable and no conclusions could be made from the trial.

However the most surprising result from these trials was that spraying wettable sulphur in temperatures of around 40°C did not cause significant burning on leaves or bunches. The only burning detected was on the young actively growing tips (ie the terminal 1cm) of Shiraz shoots. On sprayed vines, sulphur deposits on leaves and bunches were obvious, but were not associated with burning. Other experiments to determine the effects of climate and sulphur burning caused by sulphur have been carried out and the results of this work will be presented in another article.

Our experiments were carried out using Thiovit[®] a highly refined formulation of sulphur with sulphur particles that are relatively small and uniform in size. Whether similar results are achieved with other sulphur formulations needs to be tested.

The implications of the present trials are that rates of sulphur higher than those currently shown on the label for powdery mildew control will improve disease control in spray programs using only sulphur. Sulphur remains one of the cheapest materials used on vines with some formulations costing around \$2 per Kg. Although increasing the rates of wettable sulphur from 2Kg to 12Kg per Ha raises the cost of material from \$4/Ha to \$24/Ha per spray, this cost is still comparable to that of other materials used in powdery mildew spray programs.

Included in our trials was a typical spray program that included two DMI fungicide applications, (in this case Topas[®]) around flowering with wettable sulphur being applied before and after these sprays. As shown in the present and previous trials (Wicks *et al* 1997), this spray program provided effective control of powdery mildew. The cost of this program is slightly less than the one that includes only wettable sulphur applied at the highest 1.2 Kg/100L rate.

However a word of caution. Although we did not encounter major problems when spraying high rates of wettable sulphur at temperatures around 40°C, these sprays were always applied in conditions of low relative humidity. Cases of sulphur burning have been reported when sprays were applied in conditions of slow drying and high relative humidity. This suggests that further research should be done to define precisely the conditions that give rise to burning.

Although high rates of sulphur are commonly applied to vines in Europe without adverse effects further research is also needed on the use of high rates of sulphur in Australia before recommendations can be made. Potential problems associated with higher rates may be sulphur residues on fruit and leaves, undesirable long term effects on types of soil as well as adverse reactions to sulphur by workers in the vineyard. Other unknown factors are whether the high sulphur residues on leaves and bunches interact and influence the performance of other pesticides or insects such as *Trichogramma* used in IPM programs used for the control of Light brown apple moth, whether phytotoxicity develops when concentrate sprays of sulphur are used and whether high rates of sulphur are compatible with other pesticides.

The trials reported here indicate that the performance of sulphur programs can be improved by increasing the rate of sulphur applied. However these trials have only been conducted over one season, on a limited number of grape cultivars and applied in relatively high spray volumes. The effect of using higher rates when spray volumes are less than 800L/Ha and in conditions of high humidity have not been determined. While some growers may be applying higher rates already, the use of these rates is not registered at this time. An application for the use of higher sulphur rates is being considered by the National Registration Authority.

In summary, the main findings of the recent trials are –

- ?? Control of powdery mildew can be improved by using wettable sulphur rates as high as 1.2Kg/100L
- ?? High rates of wettable sulphur did not cause adverse burning to leaves or berries when applied at 40°C and low relative humidity and in spray volumes around 800L/Ha.

This is the first of a series of articles that we plan to write on the mode of activity of sulphur, sulphur formulations and phytotoxicity of sulphur.

Reference:-

Wicks, T., Emmett, R., and Anderson, C.A. (1997). Integration of DMI fungicides and sulphur for the control of powdery mildew. *Wine Industry Journal* 12: 280-282.

Table 1. The incidence and severity of powdery mildew on bunches of Chardonnay vines sprayed with sulphur or Topas at different growth stages, Loxton and Lenswood 1999/2000.

Timing of application						Powdery mildew					
<i>Lox</i>	<i>Len</i>	<i>Lox</i>	<i>Len</i>	<i>Lox</i>	<i>Len</i>	<i>Lox</i>	<i>Len</i>	<i>Lox</i>	<i>Len</i>		
<i>Oct 4</i>	<i>Oct 29</i>	<i>Oct 18</i>	<i>Nov 24</i>	<i>Nov 2</i>	<i>Dec 10</i>	<i>Nov 15</i>	<i>Dec 20</i>	<i>Nov 23</i>	<i>Jan 6</i>		
						<i>Lox</i>			<i>Dec 21^A</i>		
						<i>Bunches diseased %</i>		<i>Bunch Area diseased (%)</i>			
						<i>Lox</i>	<i>Len</i>	<i>Lox</i>	<i>Len</i>		
S		S		S		S		88	96	12	17
S		S		T		T		34	88	1	13
U		U		U		U		-	100	-	47

Where: Lox = Loxton, Len = Lenswood

S = Thiovit (80% a.i. sulphur) applied at Loxton (300g/100L) and Lenswood (200g/100L)

T = Topas (10% a.i. penconazole) applied at 12.5 ml/100L

U = Untreated vines (Lenswood only)

A = Spray applied at Loxton (only)

Figure 1. Incidence and severity of powdery mildew on the upper leaf surface of Chardonnay leaves, Lenswood 2000/01.

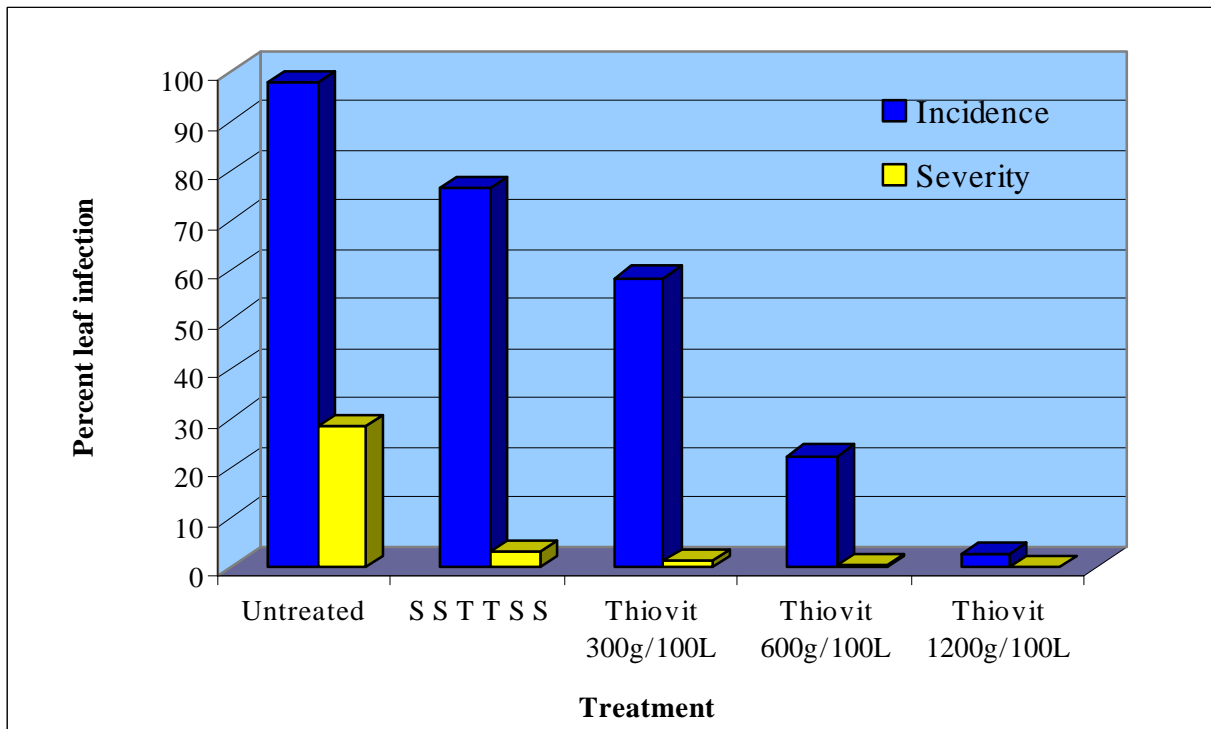
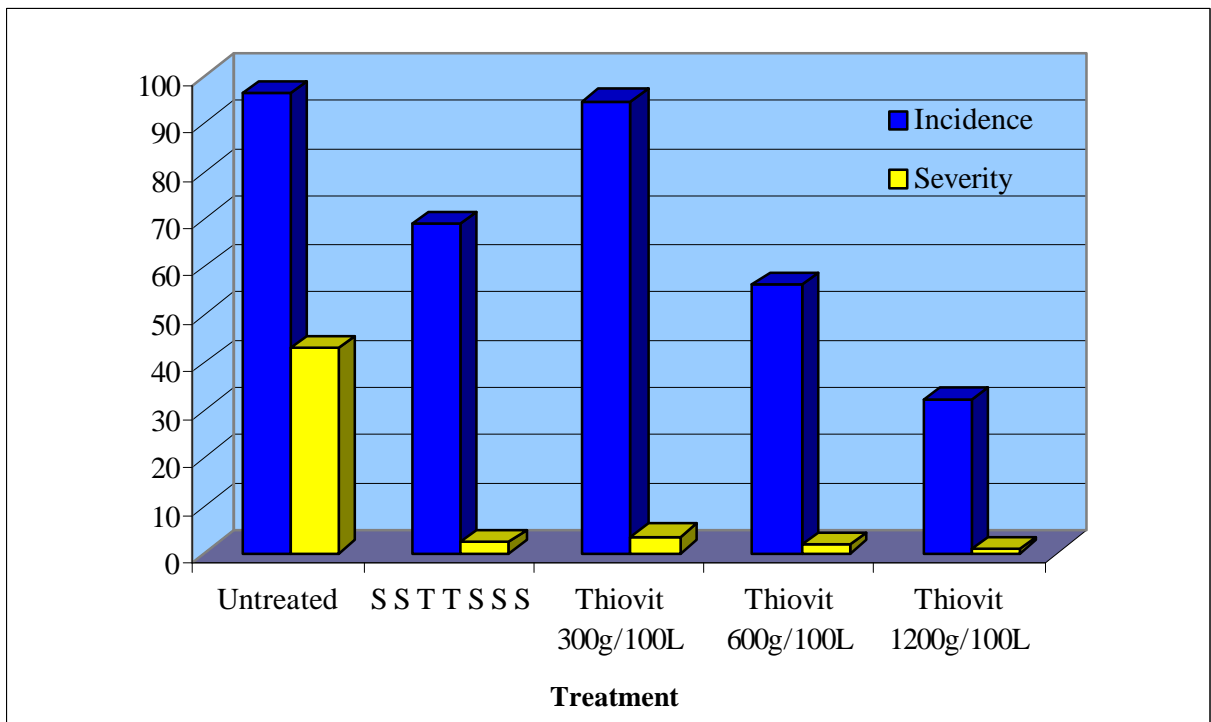


Figure 2. Incidence and severity of powdery mildew on Chardonnay bunches, Loxton February 13 2001.



Where: S = Sulphur (Thiovit 300g/100L) and T = Topas (12.5ml/100L)