RESEARCH NOTE

Occurrence of Natural Enemies of Phytophagous Mites on Grapevine Leaves Following Application of Fungicides for Disease Control

A. Schwartz

Nietvoorbij Institute for Viticulture and Oenology (Nietvoorbij), Private Bag X5026, 7599 Stellenbosch, Republic of South Africa

Submitted for publication: September 1992
Accepted for publication: December 1992
Key words: *Amblyseius addoensis*, predaceous mite, Tydeidae, fungicides, grapevine

A field trial was conducted in a Cape Riesling vineyard to evaluate the effect of different fungicides in a programme for the control of powdery mildew, *Uncinula necator* (Schw.). A post-harvest assessment indicated the presence of a diverse group of predators, with *Amblyseius addoensis* Van der Merwe & Ryke, the most abundant in all treatments.

Phytophagous mites associated with grapevine in the Western Cape Province are bud mite, *Colomerus vitis* (Pgst.) and several tetranychid spp. of which principally *Tetranychus urticae* Koch is damaging to table grapes (Schwartz, 1990). Several natural enemies which exert an influence on these phytophagous mites occur in the vineyards of the Western Cape. Of these predators the most important is the indigenous predaceous mite, *Amblyseius addoensis* Van der Merwe & Ryke. This phytoseiid is capable of keeping *T. urticae* numbers at non-economic levels in undisturbed vineyard situations (Schwartz, 1990). Other natural enemies which occur on grapevine leaves are insects and spiders.

The current insect control programme for vineyards is based on an integrated approach, whereas disease control is mandatory. Such a disease control programme prescribes intensive fungicide spraying for the control of powdery mildew, *Uncinula necator* (Schw.) Burr. and downy mildew, *Plasmopara viticola* Berl. & De T. A field trial conducted at Nietvoorbij provided an opportunity to evaluate the effect of different fungicides in a programme for the control of powdery mildew on the survival of natural enemies of phytophagous mites. Such information is necessary for the development and implementation of an integrated pest management programme for grapevines.

MATERIALS AND METHODS

A three-year-old Cape Riesling vineyard at Nietvoorbij, trained onto a Perold system, was used. No insecticides had been applied to the vines since establishment of the vineyard. The trial consisted of seven treatments, including a control, with five replications in a randomised design (Table 1). The treatments were directed towards the control of powdery mildew. Each replicate consisted of six vines from which the centre pair was selected for sampling of arthropods. Replicates were separated by buffer zones of untreated vines to minimise effects of spray drift.

Fungicide treatments commenced at the five cm shoot length stage and incorporated applications at intervals of two or three weeks. The fungicide cymoxanil/propineb (200 g/100 ℓ water) was applied on a three-weekly schedule, including the control, as a precautionary measure against downy mildew. A conventional high-pressure spray pump, equipped with two hand guns, and a manual duster were used to apply the respective treatments at recommended rates per hectare (Table 1).

Leaf sampling was carried out during the middle of April according to the alcohol-wash method (Schwartz, 1987). Five mature leaves were taken from each of the two data vines in each plot (i.e. 50 leaves per treatment). These leaves were cut to drop into a jar containing 70% ethanol solution and processed according to the aforementioned method. All phytophagous insect and mite specimens, together with natural enemies present in the supernatant, were counted with the aid of a stereoscopic microscope.

An analysis of variance of the *A. addoensis* population results was carried out to determine differences between treatments.

RESULTS AND DISCUSSION

According to the results in Table 1 several natural enemies of phytophagous mites were present on the leaves of Cape Riesling following the application of different fungicides. These included members of Arachnida (spiders and mites), Coniopterygidae (dusty wings), Thripidae (predaceous thrips) and Cecidomyiidae (gall midges – a single specimen). These insect predators are known to be high-density feeders so that the lack of prey probably accounted for the small numbers present in the trial plots. Spiders are regarded as general predators; however, quantitative data regarding their value in the control of tetranychid mites on strawberries were presented by Dippenaar-Schoeman (1976). Spider and insect predator numbers were too low for comparisons to be made. No prey was recorded from the samples.

Contrary to the situation regarding other predators, the

TABLE 1
Occurrence of natural enemies of phytophagous mites on the leaves of Cape Riesling vines, following application of different fungicides at Nietvoorbij, Stellenbosch.

Treatments	Concentration (mℓ/100 ℓ water or kg/ha)	Number of applications	Total Number of –				
			Arachnida			Insecta	
			Araneida*	Acari		Neuroptera	Thysanura
				Phytoseiidae† ‡	Tydeidae	Conioptery gidae	Thripidae
Penconazole	45	4	1	483a	88	0	1
Triadimenol	25	4	4	302abc	18	1	1
Pyrifenox	12	4	3	516a	26	0	0
Hexaconazole	30	4	4	402ab	32	0	0
Dusting sulphur	30§	6	1	177bc	32	1	0
Liquid sulphur	1000	6	0	143c	10	0	2
Control	–	–	5	134c	214	1	2

* = Spiders.
† = *Amblyseius addoensis* Van der Merwe & Ryke.
‡ = Values followed by the same letter are not significantly different at $p \leq 0,05$.
§ = Kg/ha.

predaceous mite, *A. addoensis*, was abundant. A comparison of the mean number of *A. addoensis* per treatment indicated that penconazole and pyrifenox treatments carried significantly larger numbers of the predator than the control and sulphur treatments ($p \leq 0,05$). Furthermore, the liquid sulphur and control treatments had significantly fewer numbers of *A. addoensis* compared to hexaconazole ($p \leq 0,05$). However, poor leaf quality which resulted from prolific powdery mildew growth was the likely cause for smaller numbers of *A. addoensis* in the untreated control; these results could justifiably not be used for treatment comparisons. With reference to the remaining results, it would appear that the sulphur treatments had adversely affected the predaceous mite populations. On the other hand, the recorded residual populations of *A. addoensis* averaged 2,9 and 3,5 per leaf for liquid sulphur and dusting sulphur respectively, which is considered favourable in terms of biocontrol potential (Schwartz, 1990). In view of the present finding it is interesting to note that Haas (1987) established that the fungicides folpet, triadimefon, colloidal sulphur and penconazole were only slightly injurious to predatory mites in vineyards in Italy. Furthermore, Duso et al. (1983) found that phytoseiids were numerous during the following spring where vineyard plots had previously been treated with sulphur.

Mites belonging to the Tydeidae were also recorded and were especially numerous in the control plots (Table 1), although their function remains uncertain at this stage. It was stated that they feed on Homopteran honeydew and the resultant sooty mould fungi, on other epiphytes, pollen and various plant debri (Gerson, 1985). In the vineyards of the San Joaquin Valley, California, the tydeid, *Homeopronematus anconai* (Baker), was found to be a pollen and fungus feeder, but also served as supplementary food source for the predaceous mite, *Typhlodromus occidentalis* (Nesbitt) (Knop & Hoy, 1983). However, further studies are necessary to determine the value and interaction between the local tydeid mite species and *A. addoensis*.

CONCLUSIONS

A diverse group of predators, both Arachnida and Insecta, was present on the leaves of Cape Riesling following the application of different fungicides for the control of powdery mildew. The phytoseiid, *A. addoensis*, was the most abundant in all treatments, although the mere presence of the other predators was encouraging with regard to integrated pest management.

The fact that penconazole and pyrifenox exhibited significantly larger numbers of *A. addoensis* in comparison to sulphur (dusting powder and liquid), does not detract from the value of the latter material in an integrated pest management programme. Post-treatment levels of *A. addoensis* were considered adequate to maintain tetranychid-mite numbers at non-economic levels.

The relative abundance of a tydeid mite species necessitates further study to determine their value in the vineyard ecosystem.

LITERATURE CITED

DIPPENAAR-SCHOEMAN, A.S., 1976. An ecological study of a spider population in strawberries with special reference to the role of *Pardosa crassipalpis* Purcell (Araneae: Lycosidae) in the control of *Tetranychus cinnabarinus* (Boisduval). M.Sc. Thesis (Zoology), Rand Afrikaans University, Johannesburg, Republic of South Africa.

DUSO, C., GIROLAMI, V., BORGO, M. & EGGER, E., 1983. Influence of various fungicides on the survival of phytoseiid predators introduced on vines. *Redia* **66**, 469-483.

GERSON, U., 1985. Other predaceous mites and spiders. In: Helle, W. & Sabelis, M.W. (eds.) Spider mites: their biology, natural enemies and control, vol. 1B. Elsevier, New York. pp. 208.

HAAS, E., 1987. Nebenwirkungen von Pflanzenschutzmittein auf Raubmilben und Zikaden. *Obstbau Weinbau* **24**, 70-73.

KNOP, N.F. & HOY, M.A., 1983. Tydeid mites in vineyards. *Calif. agric.* **37**, 16-18.

SCHWARTZ, A., 1987. Seasonal occurrence of a predaceous mite, *Amblyseius addoensis* Van der Merwe & Ryke (Acari: Phytoseiidae) on table grapes. *S. Afr. J. Enol. Vitic.* **8**, 78-79.

SCHWARTZ, A., 1990. Pesticide effect on populations of *Tetranychus urticae* Koch (Acari: Tetranychidae) and a predaceous mite on table grapes in the Hex River Valley. *S. Afr. J. Enol. Vitic.* **11**, 33-37.