Factsheet

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Management of Botrytis in cool climates

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Take home messages

- Adopt holistic approaches to Botrytis and non-Botrytis bunch rot control as numerous management options may be required within the one season.
- Ensure product compatibility when selecting and using biological inputs.
- Coverage is paramount, ensure all spray equipment is set up correctly to cover entire flower and bunch structures.
- Leaf removal of the bunch zone offers potential to assist in drying bunches from surface wetness. This measure also allows for greater spray coverage of flowers and bunches.

Introduction

Botrytis and non-Botrytis bunch rots are weather-driven diseases known to cause significant loss of grape yield and wine quality. Temperature and the duration of surface wetness are key environmental factors that promote bunch rot development.

In the Canberra and Tumbarumba wine regions, weather-driven disease events occur with some severity across vintages. Anecdotal reports indicate commercially produced Trichoderma species used on different grape varieties have been effective in the control of Botrytis. However, statistically analysed trials on the efficacy of Trichoderma and other biological products is not been well reported. Therefore, evidence to support the use of bio-fungicides to manage Botrytis and non-Botrytis in cooler NSW wine regions is required.

Two commercially available biological Trichoderma products supplied by Organic Crop Protectants (http://ocp.com.au/) were used in this trial; Colonizer® *T koningii* (Td67) and Antagoniser® *T harzianum* (Td81b), an unregistered *Bacillus subtilis* strain supplied by Bayer (http://bayercropscience.com.au/cs/default.asp.) was also used under research licensing.

These were compared with current grower's practice utilising chemistry, leaf removal at 80% capfall, a mixed treatment consisting of a combination of current practice chemistry and *B. subtilus* and finally a control treatment without any Botrytis fungicide application.

Application strategy

In 2015/16 an experimental trial was conducted across four separate vineyards, two sites were located at Murrumbateman (Sites 1 & 2) on Riesling and two further sites at Tumbarumba (Sites 3 & 4) on Chardonnay vines to assess 6 treatments (Table 1) which were replicated 5 times across panels of 9 vines in each vineyard with a total of 45 vines assessed for each treatment. The treatments were arranged in a randomised complete block design.

Timing of spray applications followed current farmer's practice occurring between 20–80% capfall. This timing was also consistent with the manufacturer's recommendation for the application of biological products, with all products assessed as compatible according to the manufacturer. Leaf removal was carried out at 80% capfall (EL 25) with water applied to this and control treatments at the same time as other treatments, to ensure all treatments received the same amount of applied water. Applications of products to all treatments were carried out on the same day using individual 15L calibrated knapsack spray equipment for each separate product. All products were applied at manufacturer's application and water rates per hectare.

No other spraying was conducted across the trial sites except for routine copper and sulphur sprays conducted by landholders to control powdery and downy mildews.

Treatment	Product/Actives	Date applied Tumbarumba	Date applied Canberra
T1 = Control	Water	11/11/15, 23/11/15, 6/1/16, 20/1/16	20/11/15, 1/12/15, 19/1/16, 3/2/16
T2 = Control + Leaf Removal*	Water	11/11/15, 23/11/15, 6/1/16, 20/1/16	20/11/15, 1/12/15, 19/1/16, 3/2/16
T3 = Current Practice	Scala® pyrimethanil 400 g/L (Group I) Teldor® fenhexamid 500 g/L (Group 17) Rovral®iprodione 250 g/L (Group B)	11/11/15 23/11/15 6/1/16, 20/1/16	20/11/15 1/12/15 19/1/16, 3/2/16
T4 = Trichoderma	Colonizer® *T. koningii* (Td67) 1011 cfu/gram	11/11/15, 23/11/15	20/11/15, 1/12/15
	Antagoniser® *T. harzianum* (Td81b) 1011 cfu/gram	6/1/16, 20/1/16	19/1/16, 3/2/16
T5 = *Bacillus*	Unregistered – *B.subtilis* 262g/kg	11/11/15, 23/11/15, 6/1/16, 20/1/16	20/11/15, 1/12/15, 19/1/16, 3/2/16
T6 = Mixed	Scala® Teldor® Fenhexamid 500 g/L Unregistered – *B.subtilis* 262g/kg	11/11/15 23/11/15 6/1/16, 20/1/16	20/11/15 1/12/15 19/1/16, 3/2/16

Table 1: Treatments, chemicals and dates applied at Tumbarumba and Canberra.

Growth Stages @ Tumbarumba : 11/11/15 – 20% Flowering (EL 21), 23/11/15 – 80% Cap-fall (EL 25), 6/1/16 – Veraison (EL35), 20/1/16 – Mid Veraison (EL 37), * Leaf removal conducted @(EL25) 80% Cap-fall.

Growth Stages @ Canberra : 20/11/15 – 20% Flowering (EL 21), 1/12/15 – 80% Cap-fall (EL 25), 19/1/16 – Veraison (EL35), 3/2/16 – Mid Veraison (EL 37), * Leaf removal conducted @ (EL25) 80% Cap-fall.

Outcomes

Rainfall throughout the summer of 2015/16 vintage posed a medium risk across both regions albeit a lower risk against the previous vintage of 2014–15 for Botrytis and non-Botrytis bunch rots. Tumbarumba rainfall for Jan 2016 was more than twice the long term mean for January (130yrs BOM data). Figures provided in left hand columns of Table 2. Sourced from the NSW DPI weather station network which can be accessed using the following link: https://www.awri.com.au/industry_support/weather-nsw/

Rainfall (mm) 2015/16	Canberra (Four Winds)	BOM (station 070358)	Tumbarumba (Courabyra)	BOM (station 072043)
December	25	19.6	44.8	43.2
January	78.2	68.5	137.8	113.2
February	35.6	11.0	32.8	19.4

Table 2: Seasonal rainfall figures in millimetres (mm) for Canberra and Tumbarumba 2015/16.

Just prior to commercial harvest (February 10, 2015) the level of incidence and severity of Botrytis infection on bunches was estimated from 20 randomly selected bunches per replicate. The Botrytis assessment was conducted with the aid of a standard area diagram (Evans et al. 2012). Non-Botrytis rots were evident across the trial however this data is not included in the following results.

Looking at results from the Tumbarumba site 3 (Figure 1), Botrytis was present in all treatments with Botrytis incidence and severity statistically significantly higher

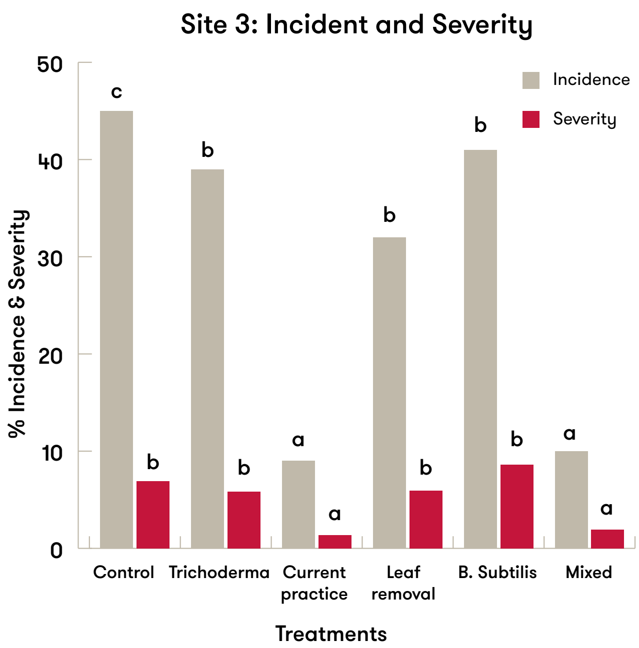

Figure 1: Incidence and Severity of Botrytis on February 9, 2016 in an experimental Site 3 at Tumbarumba. Different letters indicate significantly different values at P<0.01.

in both biological, leaf removal and control treatments compared to the current practice and mixed treatments which resulted in the lowest incidence and severity levels. This result was mirrored at Site 4 (results not shown) where the current practice and mixed treatments again resulted in statistically significant lower incident and severity to all other treatments.

Trial results from both Canberra sites contrasted those from Tumbarumba, with higher incidence of Botrytis present in all treatments (Figure 2), albeit no significant difference between any treatments at both sites. The

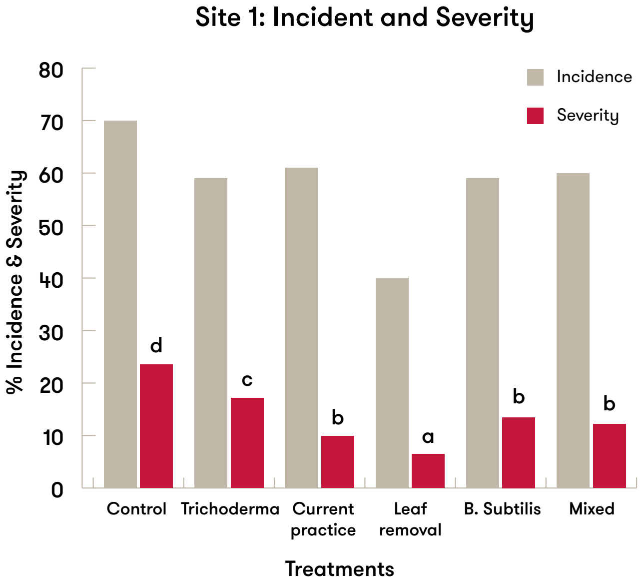

Figure 2: Incidence & Severity of Botrytis on February 22, 2016 in an experimental site at Site 1 Canberra. Different letters indicate significantly different values at P<0.01.

Figure 4: Leaf removal of the bunchzone in Riesling conducted at site 1 Canberra.

severity of Botrytis was only significantly lower for the leaf removal treatment at Site 1.

Dilution plating on Botrytis Selective Medium showed that no *Botrytis cinerea* grew from any of the inflorescences collected from the Canberra and Tumbarumba vineyards just prior to treatment application (Stage EL23, 20–50% cap fall). This indicates that infection from previous seasons did not result in endophytic *B. cinerea* colonization of the inflorescences. It also shows that at this flowering stage the inflorescences had not been infected by airborne spores from the vineyard environment. It is likely then, that the Botrytis bunch rots at harvest were caused by infection later in the season.

Figure 3: Example of Botrytis found on Chardonnay bunches during incidence and severity scoring at site 3 Tumbarumba.

Discussion

The conditions experienced across Canberra and Tumbarumba trial sites were ideal for the development of Botrytis (Figure 3) and non-Botrytis bunch rots in all treatments.

Current practice and mixed treatments undertaken at the Tumbarumba sites proved the most beneficial treatments however, when *B.subtilis* were applied as a single treatment it did not decrease bunch rot incidence or severity therefore highlighting the importance and appropriate use of early flowering fungicide spray applications. The Bayer biological product was applied at the low end of the permit rate at 100g/ha, with the permit range between 100g–5kg/ha, after consultation with Bayer representatives a rate of 250g/100L was suggested as results from other viticultural trials have proven to be beneficial.

Natural isolates of Trichoderma resulted from incubated inflorescences at three of the four trial sites and natural Bacillus isolated from bunches at harvest at both Canberra sites, no bunches were analysed from the Tumbarumba sites. There was no relationship between the *Bacillus subtilis* and Trichoderma applied with the commercial product during the season and the *B. subtilis* and Trichoderma isolated at harvest, except at site 1 Canberra. Indicating that the commercial product did not survive the conditions experienced throughout the season and further applications of both biologicals may have been required to maintain product efficacy.

Leaf removal at bunch closure to open up the canopy in the bunchzone demonstrated a trend across all sites at reducing incidence and severity albeit only resulting in a statistical significant difference of lowering severity at site 1 (Figure 4) at Canberra against all other treatments. Given water was applied to bunches in these treatments when any other treatment application was undertaken further investigation of leaf removal is warranted, without the application of water and introduction of leaf removal at other growth stages may provide greater benefit.

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Further Information

The factsheets available on the Wine Australia website: www.wineaustralia.com

'Botrytis Management' provides more information on integrated measures for control of Botrytis bunch rot.

'Non-Botrytis bunch rots: Questions and Answers' provides more information on integrated measures for control of non-Botrytis bunch rot.

'Alternative bunch rot control – Experimental trial' provides more information for control of Botrytis bunch rot in warmer humid environments.

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