LADYBUG TAINT: PART 2

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Basic Wine

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Ladybug infestations in 2001 led to major product loss in grape-growing areas such as Ontario. Linda Franklin, executive director of the Wine Council of Ontario, a trade association of wineries, said that about **20% of the province's wine production was affected**. The Ontario wine industry had to discard more than a million litres of wine as they did not want to the release tainted wine, thereby protecting the reputation of their industry.

The **effects of ladybug taint can be potentially detrimental** and although it is not a problem in the South African wine industry, **producers need to familiarise themselves with ladybug taint** to be **prepared to prevent and treat** the threat when needed. Part 2 of this blog series will briefly look at options to avoid/remediate the taint.

HOW TO PREVENT LADYBUG TAINT

The ladybug-derived **methoxypyrazines are extracted from the bugs relatively quickly** (within 24 hours of maceration) and it is important to

1) LIMIT THE NUMBER OF LADYBUGS PRESENT ON THE GRAPES BEFORE PROCESSING
2) MINIMISE THE DURATION OF CONTACT DURING PROCESSING

Ladybug **populations can be controlled by limiting their primary food source, mainly aphids**. Large infestations will not occur if the food source is scarce. The use of **pesticides** can be used to control food sources such as aphids as well as beetle populations. **Good weed and cover crop management** within the vineyard can also help control insect populations.

The harlequin beetle **does not cause initial berry injury**[1], however, **berry damage** due to other factors can potentially **support a growing population**. Therefore, growers should **closely monitor the incidence of berry injury and addition to infestations in clusters**.

If present on the grapes during harvest, processes such as **destemming will help to remove** some of the insects from the fruit. **Minimising skin contact and pressing as quickly as possible** will reduce the available time for the secretion and extraction of methoxypyrazines from the ladybugs present.

REDUCING THE TAINT

Other treatments that might help **reduce the unwanted methoxypyrazines** have been tested on juice and wine with generally **limited or mixed results**. Some of these include:

CLARIFYING THE JUICE BEFORE ALCOHOLIC FERMENTATION

Settling and clarification of the juice before fermentation is an effective tool to decrease the methoxypyrazine concentration[2]. Thorough settling and racking of the juice before fermentation can reduce methoxypyrazine content by more than half, however, it should be noted that in this particular study, the initial turbidity of the juice (before settling) was 1280 ntu[2].

THERMO-VINIFICATION

Thermo-vinification has been shown to be effective at reducing methoxypyrazine content in must[3]. Heating the must for a short period between 60°C – 80°C can potentially reduce the concentration by up to 67%[4] (most likely by evaporation loss). However, this is not a practice typically done on Sauvignon blanc must due to unfavourable effects impacting the wine quality.

FINING WITH SILICONE AND POLYLACTIC ACID[5]

Even though it is not traditionally used in winemaking processes, the addition of **silicone and a polylactic acid-based polymer** resulted in a significant decrease in methoxypyrazines without altering the desirable aromas[5–8]. The exact protocol for the use of these polymers still needs to be developed, however, there are several potential applications and uses. Polylactic acid can be manufactured in a variety of forms with different physical properties. Due to this flexibility of processing, the product can be integrated into existing filtration systems, manufactured as inserts for larger tanks or added as pellets directly to the juice and/or wine[6,9].

FINING WITH MOUSEMAJOR URINARY PROTEIN

An **odorant-binding protein** (mMUP) with **high specificity for methoxypyrazines** can reduce levels from 300 ng/L to just 5 ng/L[7,10]. The protein binds the methoxypyrazines and is then removed from the must or wine by fining with bentonite. Product development and optimization are underway at Brock University, Ontario, Canada[9].

LIGHT TREATMENT AND IRRADIATION

Some studies have found **exposure to sunlight** to reduce the methoxypyrazine concentration in wine, however other studies reported no consistent effects from light exposure or bottle colour[11–13]. The indirect effect of sunlight exposure also needs to be considered as sunlight treatment can lead to increases in temperature which can have detrimental effects on wine quality.

REDUCE THE PERCEPTION OF THE METHOXYPYRAZINES (SENSORY MASKING)

Certain winemaking practices such as fermenting with specifically selected yeast strains and/or the use of oak could lead to the formation and/or extraction of **other flavour compounds that could help mask some of the aromas contributed by methoxypyrazines**. Yeasts differ in their ability to produce aroma compounds and by selecting a yeast that will contribute fruity aromatics (for example), the inherent greenness of the wine can be masked. Thus, the methoxypyrazine concentration will largely remain unchanged, however, the sensory perception of the compounds will be suppressed. The **effectivity of these approaches will depend on the type and concentration of the masking compounds as well as the concentration of methoxypyrazines present**.

Blending a ladybug tainted wine with a wine containing no methoxypyrazines and/or high concentrations of masking compounds is probably one of the most useful tools to dilute and mask the taint. Sensory interactive effects still need to be considered and blending trials are advised.

CONCLUSION

While no infestations have been publicly reported in South African vineyards, **knowing the potential harm of lady beetles is important** for grape growers and winemakers to be best prepared and able to respond if an infestation were to occur.

Remedial treatments show low success rates, therefore ensuring the viticultural and winemaking team is informed is key to spot and prevent the problem from manifesting.

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