

Croplands QM380 sprayer setup for VSP winegrapes

Outline

This factsheet provides recommendations for configuring QM380 heads for use on VSP winegrape canopies

These recommendations were based on independent tests conducted in Marlborough and Hawkes Bay in 2008



Figure 1 A three row Quantum Mist™ sprayer with QM380 heads on a 2.4m row merlot block in Hawkes Bay (Feb 2008).



Figure 2 The QM380 heads on a three row sprayer in Marlborough



Figure 3 The Hawkes Bay Chardonnay canopy used in some of the tests.

QM380 tests

The first commercial use of the new QM380 fan heads on Quantum Mist™ sprayers was made on winegrapes in Marlborough and Hawkes Bay in New Zealand in the February 2008. Croplands commissioned an independent test of these sprayers to assess fan performance and resulting spray coverage in order to identify and recommend configurations for use of the new heads.

Inner canopy spray coverage was assessed from the QM380 heads in a total of 20 different configurations involving different head angles, fan speeds and travel speeds.

Coverage from the QM380 heads was compared with coverage in the same canopies from a Quantum Mist™ with QM500 heads, a Silvan GIII air shear sprayer (both in Marlborough) and from a Bertolini sprayer fitted with Holder Crossflow heads (Hawkes Bay).

The tests were conducted on four different VSP canopies; Pinot Noir and Sauvignon Blanc in Marlborough and Merlot and Chardonnay in Hawkes Bay. These canopies were well managed and free from visible diseases or pests. All canopies were planted on 2.4 metre row spacings, with a canopy wall height of 0.6 or 0.7 to 2.2 metres. The Marlborough canopies were denser than those in Hawkes Bay, with average leaf layer numbers ca. 3.5 in Marlborough and 2.6 in Hawkes Bay. All canopies had been mechanically leaf plucked in the bunch zone, but all had relatively high leaf cover of bunches at the time the tests were conducted.

Spray coverage was assessed using water sensitive papers placed on spray poles located in the inner canopy at five different heights. At each height folded water sensitive papers were held either horizontally or vertically to provide four distinct surfaces on which spray deposits could be observed. A series of tests were conducted using the same spray poles, to allow comparison of deposits from different sprayer configurations, or from different sprayers.

QM380 fan head configuration recommendations

When describing head configurations for Quantum Mist™ sprayers it is useful to record all measurements to the centre of the fan at the face of the outlet guard. It then becomes easy to describe the sprayer configuration in terms of the height of each head off the ground, the distance of the heads from the row centres and the upwards, or downwards in which each is oriented. Using this system it is possible to record sprayer configurations so that they can be repeated in the future or by other operators.

Basic setup

When setting up any sprayer for a canopy, and when making seasonal adjustments for canopy growth, it is important to park the sprayer in the canopy to be sprayed and generally orient the heads and nozzles.

Make sure that all of the target will be covered with no risk of gaps caused by striping. Striping is a common problem on sprayers with many small profile ducts. Striping can occur on a Quantum Mist™ sprayer if the heads are; too close to the canopy, too far apart vertically and/or not angled upwards and downwards to provide some convergence of the spray plume.

In VSP grapes it is sensible to direct a greater proportion of the spray output towards the bunch zone as bunches are the critical and most difficult spraying target to cover. A split of 60% to the bunch zone and 40% to the upper canopy has proved successful and is recommended as current industry best practice. All of the coverage tests in this study used this type of split in output volumes.

Nozzle angles

Check that all nozzles are working and are not directed so far out from the fan that the spray fails to become entrained in the airstream. Operator attention to nozzle angles on the QM380 heads is most important when heads are operated at low speeds (below 1500 RPM) and/or when the heads are brought in closer than ca. 0.8m from the canopy. Bringing heads closer to the canopy, slowing the fan speed down and angling the nozzles in towards the centre of the fan allows placement of a defined band of spray to as little as the diameter of the head. This can be useful for bunchline or cordon applications.

Head angling

The QM380 and QM500 fans produce an expanding plume of air and experience with both in VSP grape canopies confirms that the heads work best when pointed directly at the canopy rather than forwards or backwards angled relative to the direction of travel. Forwards or backwards angles of over 5-10° tend to reduce canopy penetration and can end up driving the spray plume along the surface of the foliage wall.

Some upwards and downwards head angling has proved useful (see below). However, in typical NZ VSP canopies the QM380 has been found to perform best when upwards and downwards head angling has been kept below 20°, with 0-15° found to be best.

Basic QM380 head configuration recommendations

A good basic configuration for general canopy spraying with the QM380 was found to involve the following:

- Divide the canopy into two vertical sections – the bunch zone and the canopy above the bunch zone.
- Set the heads on the dropper arms so that they are pointing directly towards the canopy (no forwards or backwards angle), with the face of the fan at 0.5-0.8 metres out from the centre of the canopy row. Closer than this and it is likely that striping will occur (a gap in coverage between the heads), further out than this and canopy penetration and coverage efficiency may be compromised. Use a greater head distance from the canopy when trying to spray a taller foliage wall.
- Position the top head no lower than the centre of the upper canopy. Options are either to centre it on the upper canopy and have no downwards angle on the head at all, or bring the head ca. 0.2 metres above the centre of the upper canopy and give it a downwards angle of around 10-15°. As downwards angle is increased the head height will need to be increased to ensure that the spray covers the top of the canopy.
- Position the lower head slightly below the centre of the bunch zone and angle the head up at around 10-15°. The only time it appears useful to have the bunchline head spraying at 0° is when the head is brought in close to the bunches for bunchline spraying.
- On a typical VSP canopy with a bunch zone at 0.7-1.1 metres and an upper canopy zone of 1.1 to 2.2 metres above the ground lower and upper head heights will be approximately 0.9 and 1.7 metres respectively.
- Early in the season as the canopy is still developing it is sensible to lower the upper head – remember any spray that is not immediately directed at the target canopy is going to be wasted.

Air output volume requirements

The small QM380 fans were found to provide best penetration and coverage of the inner canopy regions when operated at fan speeds around 2500 RPM.

If the heads are to be used to apply a targeted bunch zone spray it is recommended that they are brought as close as practical to the bunch zone and the fan speed reduced until visible losses are minimised (probably around 1000-1500 RPM).

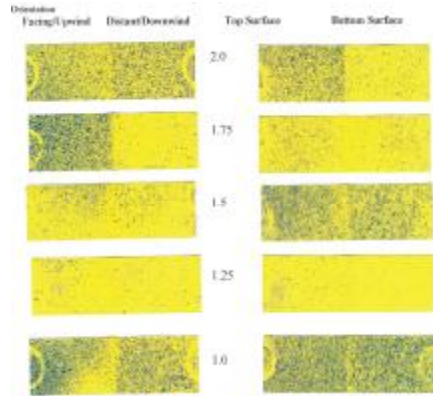


Figure 4: Water sensitive paper coverage from QM380 fans; Marlborough VSP Pinot Noir, 350 l/ha, 7.5 km/hr. 2500 fan rpm.

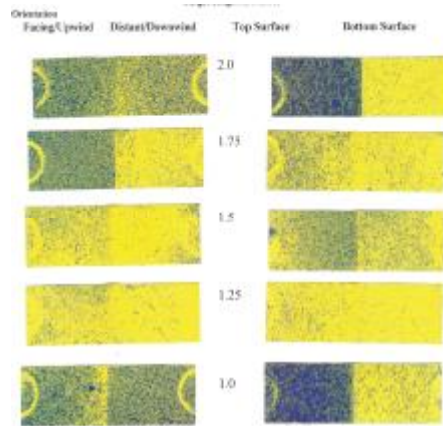


Figure 5: As for Figure 4 but application volume increased to 500 l/ha.



Figure 6: Showing the sprayer with heads configured for achieving the coverage shown in Figures 4 and 5.

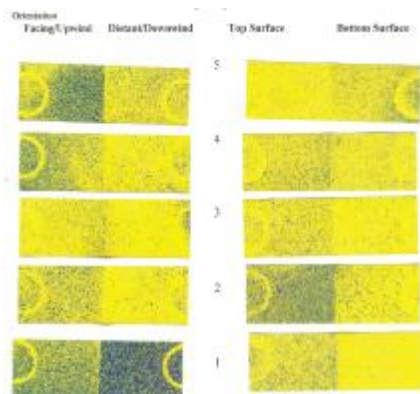


Figure 7: Water sensitive paper coverage from QM380 fans; Hawkes Bay VSP Chardonnay, 300 l/ha, 9 km/hr. 2500 fan rpm.

Travel speed and application volume options

The QM380 heads were found to provide consistent spray coverage across a range of travel speeds up to 9 km/hr (coverage tests were not conducted at higher speeds).

The water sensitive paper deposits shown in Figures 4 and 5 demonstrate the effect of increasing application volumes from 300 to 500 litres per hectare. In both cases most water sensitive paper surfaces show reasonable and acceptable deposits with even distribution of fine droplets. However, the deposit intensity is obviously increased at the higher application volume (Figure 5).

Comparison with other sprayers

Figures 7 and 8 are a direct comparison of deposits from the QM380 heads with those from Holder Crossflow heads at the same application volume and similar travel speeds. The output from the QM380 heads was delivered using twice as many hollow cone ceramic TX nozzles as were available on the Crossflow sprayer. This meant that the QM380 delivered a finer droplet size and provided slightly better canopy coverage in this comparison.

The QM380 heads were found to perform as well as or better than the Silvan GIII, the QM500 and the Holder Crossflow sprayers used for comparison in these tests.

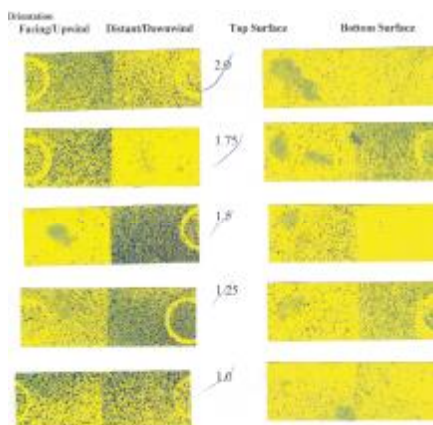


Figure 8: Water sensitive paper coverage from a Holder Crossflow sprayer, Hawkes Bay VSP Chardonnay, 300 l/ha, 8.9 km/hr.



Summary Information

- The air output from the QM380 heads provided excellent visual mixing and turbulence of droplets in the spray plume, especially when fan speed exceeded 2000 RPM.
- The QM380 spray heads provided acceptable inner canopy coverage on mature and relatively dense NZ VSP grapevine canopies.
- The heads performed well across a wide range of configurations with different head angles and distances from the canopy. On this basis, the sprayer should not require constant adjustment to optimise its performance between different blocks.
- The heads performed well across a wide range of sprayer travel speeds and did not appear to require interaction of opposing heads to achieve canopy penetration and coverage. Best full canopy coverage was achieved with fan speeds of 2500 RPM.
- The QM380 heads should prove a useful option for winegrape spraying in New Zealand, especially where their smaller size and lower cost and input power requirements (compared to QM500 heads) allows them to be used for three row spraying.

Useful Websites and references

Quantum Mist™ sprayer information <http://www.croplands.com.au/pages/documents/CE54QMV4.pdf>

WineGrowers of New Zealand Sustainable Winegrowing Spraying Best Practice Fact Sheets: Spray coverage assessment using water sensitive papers.

Acknowledgements

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Factsheet prepared by

Dr David Manktelow (Manktelow and Associates Ltd) as part of an independent test on the setup and performance of the new QM380 for use in cool climate VSP winegrapes commissioned by Croplands in 2008.