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THE EFFECT OF SPRAY APPLICATION VINEYARDS

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Poor spray coverage is a major factor contributing to poor disease control in grapes. Better Better coverage leads to better control, and a thorough application of an effective material is is required. Uneven coverage increases the amount of fungicide that must be applied in order to order to provide adequate control on poorly covered areas and the number of sprays required if it required if it allows a disease to become established.

Whilst canopy size and shape will affect application volume, there are dangers in not applying applying enough spray and in applying too much spray. There is an optimum quantity required required for a thorough coverage of the target. The old adage that you should spray until the the leaves drip is misplaced; likewise, lowering spray rates to below the minimum which offers offers control is also misguided advice.

A number of growers have reduced application volumes to extremely low levels and are observing poor disease control due to inadequate coverage. Interestingly, research around the the world confirms similar results and also indicates that there is an optimum volume to provide provide thorough coverage and disease control.

Background

Physics is a wonderful subject!

A droplet with twice the diameter of another has four times the area and eight times the volume. volume. Eight smaller droplets having the same total volume as the larger droplet will provide provide twice the coverage of the larger droplet.

Conversely, for the same volume of liquid, when you halve the diameter of a droplet you increase the number of droplets eight-fold. For instance, when a single 200 micron droplet is is halved to 100 microns, you disperse its liquid into eight of these smaller droplets. Halve them them again to 50 microns and you now get 64 droplets etc.

Similarly, the area covered increases as the size of droplets decreases, assuming the volume volume stays the same. As shown above, a 200 micron droplet has 64 times the volume of a 50 a 50 micron droplet. Assuming the target area covered by a droplet is equal to its cross sectional sectional area, 64 droplets of 50 microns will cover four times the area of a single 200 micron micron droplet, even though both scenarios involve the same amount of spray.

This shows why Controlled Droplet Application (CDA) sprayers with their large number of small droplets can be so successful (provided their droplets hit the intended target rather than than drift!) since the small droplets adhere to the leaves and provide good surface coverage. coverage.

A combination of the optimum volume and droplets that adhere to the leaves will provide good good disease control. It must be stressed that too fine a droplet will result in off-target drift and drift and equally important, especially in hot weather, lead to evaporation of droplets.

Literature review

A review of global literature proves this reasoning. Unfortunately not all authors state canopy canopy size and variety.

Pergher and Gubiani (1995) conducted experiments in hedgerow vineyards in Italy during June June (at the end of blossom) and July (full canopy) to assess the influence of spray application application volumes from an axial fan sprayer. Increasing spray application volume led to higher higher losses to the ground and lower deposition on foliage. However, differences were only significantly different in the July experiment. Losses to the soil ranged from 34.5 to 36.8% for for the lower spray volume of 31 - 39gpa and from 41.3 to 48.9% for the medium spray volume volume of 65-78gpa.

Three airblast sprayers were compared by Pergher et al (1997) in an Italian hedgerow vineyard vineyard in July whilst in full canopy. They used high volume (135gpa) (conventional airblast) airblast) and low volume (25gpa) (similar to an AgTech or Kinkelder). They found no

substantial differences in total pesticide loss between the sprayers tested. Both sprayers were were capable of applying more than 64% of the sprayed material onto the leaves and grapes. grapes.

Riley et al (1995) reported on the development and testing of sprayers in medium-heavy canopies in Australian vineyards. The airblast sprayers were used at 10, 30 and 50 gpa. At 10 10 gpa there were 404 drops/cm2, at 30gpa 805 drops/cm2, and at 50gpa there were 493 drops/cm2 on the front of the leaves. On the back of the leaves the number of drops/cm2 was was 224, 426 and 410 respectively. These results clearly show how an optimum volume, in this this case 30gpa, provides the most leaf coverage whereas an extremely low and a higher application volume results in a smaller number of drops/cm2. The results also indicate the variation found between front and back coverage and the importance of good air movement to movement to prevent leaf shingling and ensure canopy penetration.

Landers et al (2001) conducted a trial in a Niagara vineyard using a **Proptec** CDA sprayer. [This [This unit uses a rotary cage to create droplets which can be directed into the crop canopy. canopy. Liquid is fed into the high-speed spinning cage where centrifugal forces spread the liquid and throw it from the periphery]. When used at 25gpa, the **Proptec** provided disease control statistically equivalent to that provided by the airblast at 50 gpa. However, control was was noticeably inferior when the **Proptec** spray volume was increased to 50gpa. This compared compared favourably with trials carried out in 1999 which showed that spray deposition with the with the **Proptec** was greater at 30gpa than at 50gpa, (Landers et al 2000).

This raises a number of interesting questions -- in particular, why should the same rate of active of active ingredient in a lower quantity of carrier (water) give better results? A possible (even (even probable) answer is that when lower water rates are applied via smaller droplets in a good, good, directed airflow, these droplets attach themselves more readily to the canopy than do the do the larger droplets in higher water rates, which are more prone to run-off. Additionally, it is Additionally, it is likely that the greater surface coverage provided by the smaller droplets (see (see above) provides a more uniform coverage of the fungicide on leaves and fruit, which should should improve the activity of materials that do their work directly on the surface (eg, mancozeb) and optimize the uptake of those that are absorbed into the waxy cuticle (strobilurins) (strobilurins) or into the body of these tissues (sterol inhibitors).

A good comparison is the application of pesticides on many crops via aircraft at extremely low low rates of carrier providing the same levels of control at the same a.i rates provided by ground ground machines using considerably higher water volumes. But experience shows that if they they reduce volumes too much they lose efficacy.

The aim of good pesticide application is to provide many small droplets which will stick to the the surface of the leaf. If the volume applied is too great, leaf surface run-off occurs, removing removing fungicide from the leaves. If the volume is reduced too much, then there aren't enough enough droplets to cover the leaves, thus not providing a thorough coverage for disease control. control.

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