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Techniques to reduce spray drift pollution from vineyards

Several mitigation techniques can greatly reduce spray drift pollution from pesticide spraying in agricultural systems, shows a new study. Researchers tested the effectiveness of several strategies; results ranged from a 38% reduction in spray drift using low-drift equipment to a 98% reduction when hedgerows are present alongside fields.

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When pesticides are sprayed on agricultural fields, some of the droplets drift to surrounding areas on air currents. European legislation[1] places drift as one of the top three pathways for pesticide pollution. There is growing concern for people in residential areas surrounding agricultural fields. These fragmented landscapes are common in the Italian pre-Alps, for example in the Prosecco-Conegliano-Valdobbiadene territory, a large area with vineyards that produce 60 million litres of wine per year, valued at €360 million. As farmers and residents call for adequate information on exposure, there is also an urgent need for field tests to evaluate ways of reducing drift from air-blast sprayers.

Responding to this need, a group of researchers tested the effectiveness of mitigation strategies on a 15 hectare vineyard in the northeastern Italian pre-Alps in August 2013. To detect the spray drift, water sensitive paper cards were placed at different distances from the sprayer. To compare methods, the researchers calculated a 1% line, which is the distance from the sprayer where the drift equalled only 1% of the original applied rate.

The experiment tested high- and low-drift equipment under four experimental conditions. One allowed the free expansion of drift — in the absence of vines — to see its maximum range. In a second condition, the researchers measured the spray drift that bypassed the last treated vineyard row, allowing them to test if the vine canopy itself can mitigate drift.

Vineyard pesticide sprayers have air-assistance fans that propel the spray onto the vines, which can exacerbate drift. Another test measured the effectiveness of turning off this air-assistance. Lastly, the study observed how different densities of hedgerow reduced drift.

The study looked at three hedgerows with different optical porosity — a measure of how dense they are and consequently how likely it is for drift to travel through them. They sprayed sparse, medium, and thick hedges for the experiment, which mitigated 85.5%, 87.5%, and 91.7%, respectively. This shows multiple hedge types are effective mitigation methods. In fact hedgerows were always effective, and produced mitigation up to 98% (when combined with low-drift equipment, for example).

When comparing just the high- and low-drift equipment in free expansion, the low-drift equipment was an effective mitigation strategy and reduced potential drift by 38%. For the high-drift equipment the 1% line was calculated at 14.5 metres, while the low-drift equipment's 1% line was 9 metres.

Compared with free expansion, vine curtains mitigated drift by approximately 70% (if sprayed with low-drift equipment in the summer, in their full leaf stage). This showed that the crop itself can be an important mitigation method. Furthermore, when the last row was treated without air-assistance, mitigation was 74%.

To optimise these benefits there are several steps farmers can follow. Switching off air-assistance for the last two to three rows, spraying the last row only inwards, and replacing poor growing plants to keep a full canopy can all help mitigate drift pollution.

The researchers say the '1% line' method is useful for assessing harm to some wildlife, but note that there may still be a risk to nearby surface water like ponds and streams. The sensitivity of surrounding areas must therefore be taken into account when spraying.

The authors say their results show how anti-drift equipment and techniques can significantly mitigate drift and recommend that environmental regulatory programmes include these techniques for implementation on a regional scale.

1. Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0128