NEED TO KNOW
GLOBAL EXTENSION TEAM

ORCHARD SHELTER AND SPRAY DRIFT PREVENTION

NK55
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AT A GLANCE

Effective Shelter can significantly reduce Spray Drift risks

Effective shelter needs to be; taller than the height of spray emission, three dimensional, and permeable enough to allow some air to move through it with no significant gaps.

Single layers of artificial wind break material will slow wind speeds and capture some spray drift, but they allow too much spray to pass through to reliably prevent spray drift.

Whilst natural shelter is best, double layers of shelter cloth with a gap between the layers can also be effective drift preventers.

Slowing wind speeds and turbulence

Shelter will directly capture drifting droplets, but a big part of the shelter effect on preventing spray drift is to slow wind speeds and allow potential drift droplets to fall out within the block.

Overhead netting is a very effective wind speed reducer and stabliser and will help to reduce losses of very fine droplets.

SHELTER EFFECTS ON SPRAY DRIFT

Orchard shelter can work to massively reduce risks of spray drift through a combination of;

- reducing wind speeds experienced within sprayed blocks; allowing spray droplets to deposit before they leave the sheltered area,
- potentially reducing air turbulence and lifting and dumping effects that can carry droplets projected above the crop higher into the air, and by
- presenting a collection surface that spray droplets can deposit onto.

The slowing of wind speeds due to interaction with natural and artificial shelter creates an area of higher pressure on the upwind side of the shelter. This "air cushion" effect slows airborne spray droplets and aids their sedimentation to the ground, or their deposition on the shelter. However, as wind speeds and/or shelter density increase there is an increasing risk of wind and spray droplets being forced up and over the shelter, with droplets potentially transported beyond normal buffer zone distances.

Figure 1: Wind speed in a shelter gap measured at 4.6 m/s, almost twice that experienced behind an effective shelter. This shelter collected virtually all of the spray that reached it.

The potential effects of shelter on spray drift risk reduction are widely acknowledged. NZ Standard NZS8409 (The Management of Agrichemicals) recognises that the presence of effective shelter around sprayed areas can allow downwind buffer zones for airblast spraying to be reduced from around 30 metres down to around 10 metres.

Rules of thumb on shelter as a drift reduction tool include:

- Natural (live) shelter is much more effective than single layer artificial shelter.
- The porosity and density of the shelter is important – a minimum thickness of around

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1m and a porosity of about 50% is recommended. A width to height ratio of about 3.5 is recommended (3.5m high, 1m wide)

- Porosity and density are a function of the thickness of the shelter – the goal is to achieve a reduction in wind speed and to have air pass through the shelter.
- Needle-like leaves are more effective at capturing droplets than broad leaves. Evergreen species will provide more protection throughout the year.
- Any spray released at or above shelter height will not be contained by the shelter.

Figure 2: A double line of 80% porosity shade cloth providing an effective spray drift shelter around an organic apple orchard in Hawkes Bay.

FACTORING SHELTER INTO SPRAYING RISK ASSESSMENTS FOR PRACTICAL SPRAY DRIFT CONTAINMENT

There is ever increasing pressure for sprayer operators to effectively prevent off-target spray drift. This is especially important when spraying dormant and developing kiwifruit canopies as the lack of leaves on the crop increases the risks of spray losses beyond the treated area.

The kiwifruit industry has adopted the use of drift reduction spraying techniques for dormant and spring canopies in response to these pressures. While these are highly effective, off-target spray losses can still occur and shelter is one of the most effective tools that we have to further reduce risks.

Sprayer operators are expected to undertake risk assessments at the time of spraying and to either not spray, or to change spraying practices in situations and parts of the orchard where drift risks are a concern.

There have been a lack of guidelines to allow different shelter (artificial shelter especially) to be characterised for its drift risk reduction potential. Observations from a recent Zespri funded project offer some useful points on drift risk reduction by shelter;

Including shelter in a spray drift risk assessment

- Evergreen shelter with needles is usually a more effective drift collector than larger leaved deciduous shelters.
- If you can easily see whether someone on the opposite side of a shelter is wearing clothes or not the shelter will probably be too open (permeable) for effective drift containment.
- Two layers of artificial shelter of 50% permeability or greater, with a gap of 100mm or greater between the layers, can provide a level of drift reduction comparable to natural shelter.
- Visible gaps of greater than about 1-2 m^2 are likely to become wind funneling points and can cause a local increase in drift losses.
- A double layer of artificial shelter can potentially be used as a practical tool to fill gaps in natural shelter.
- Overhead hail and bird netting is far more open than wind break cloth so does not

ORCHARD SHELTER AND SPRAY DRIFT PREVENTION

NK55
July 2021

directly prevent spray drift losses. However, overhead netting significantly reduces windspeeds within netted blocks and can greatly reduce wind turbulence and the potential for the spray plume to escape from the netted area.

IN CONCLUSION

Reliable containment of off-target spray to within property boundaries is becoming increasingly important to maintain our ability to access and use agrichemicals.

Spraying risk assessments require sprayer operators to recognise wind strength and direction near potential sensitive areas and property boundaries, and to ensure that appropriate buffer zones are used to allow any spray losses to deposit safely.

Effective shelter greatly reduces the size of the buffer zones required to protect sensitive areas. Blocks without effective shelter and gaps in the shelter will require larger buffer zones.

Figure 3: Testing drift reduction from artificial shelter in a 2 m/s wind. Approximately 50% of the droplets that reached the shelter passed right through this single layer artificial shelter.

FURTHER READING

- KiwiTech Bulletin N39 – Best Practice Guide – Spraying https://canopy.zespri.com/EN/industry/pubs/kiwitech/Documents/N39.pdf
- KiwiTech Bulletin N98 – Dormant and Early Spring Spray Application https://canopy.zespri.com/EN/industry/pubs/kiwitech/Documents/N98.pdf
- Support for Safe Spraying Booklet https://canopy.zespri.com/EN/grow/GET/GET-webinar-series/Documents/Guide-to-safe-spraying.pdf

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