Grower Summary

PO 008

Improving the efficiency of spray application for protected ornamental crops: a study of current spraying methods and novel spraying technologies (phase 2: laboratory and nursery studies)

Final 2014

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Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of this report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Project Title:	Improving the efficiency of spray application for protected ornamental crops: a study of current spraying methods and novel spraying technologies (phase 2: laboratory and nursery studies)
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GROWER SUMMARY

Headline

Spraying at 400 L/ha as opposed to 2,000 L/ha saves around £10 in labour per hectare by reducing the down time required to refill the sprayer with water.

Where crop protection products as are used at a set number of millilitres per litre of water (for example Dazide Enhance (daminozide) and Chess WG (pymetrozine)), reducing water volumes per hectare results in additional pro-rata savings in pesticides.

Background

This project follows the literature review undertaken in 2012 by the late John Buxton, the projects aims were to:

1. Improve the efficiency of spray application in ornamental crops,
2. Highlight novel technologies that ornamental growers can readily adapt.

Phase one of the project addressed both points, the second phase of the project focused on improving the efficiency of spray application. This included measurements of the droplet size distribution in the spray from a Ripa spray pistol using both 1.2 mm and 2.0 mm nozzles. Droplet characteristics were quantified by laser diffraction imaging (using a ‘‘Spraytec’’ laser produced by Malvern Instruments Ltd) at the NIAB/TAG Silsoe Spray Application Unit. In addition to this laboratory work visits to commercial nurseries across several regions of England examined and calibrated high volume sprayers as used in the production of protected ornamentals. A total of six nurseries were visited in The Vale of Evesham, Spalding and West Sussex; two nurseries were visited within each of these important production areas of the UK. Commercial nurseries included within this study were representative of large and small nurseries within England.

Summary

The first phase of the project reviewed the current methods of applying crop protection products to protected ornamentals within the UK and Europe, the second phase evaluated the research findings in context with current practice. Traditional nozzles and more recent, new nozzle developments were appraised for their suitability for use within the protected ornamentals sector. The following novel spraying systems were reviewed: electrostatic sprayers, ultra-low volume systems (ULV Systems), spray cabins (Degramec, Belgium), Micothon and CMW semi-robotic sprayers, gantry sprayers: these can be fully automatic or semi-automatic (Visser Spray-O-matic) and automatic self-propelled sprayers (Balsari and

Visser Spray-O-matic). The second phase of the project measured the droplet size distribution from a Ripa spray pistol fitted with new 1.2 mm and 2.0 mm nozzles and a worn 2.0 mm spray nozzle at Silsoe Spray Applications Unit. An instrument using laser diffraction measured the droplet size distribution in the spray. This revealed that, as expected, increasing the operating pressure reduced the mean droplet size. A worn tip increased both droplet size and flow rate which further increased water volumes. Increasing operating pressure also increased droplet velocities. It was not possible to return the pistol to a setting that gave the same droplet distribution precisely or in a fully repeatable manner. Settings and pressure combinations to achieve the required spray quality are very different to the settings used by the agricultural industry. As suspected, all the participating nurseries visited were using very high water volumes to apply crop protection products. This is inefficient in terms of labour and applies more pesticide than is needed in some instances; which is wasteful and has environmental and cost implications.

Financial Benefits

Using a lower water volume to treat 1 ha (hectare) reduces the down time taken to fill the sprayer. Assuming that a 200 litre trolley sprayer is used, this will save around £10 in labour per hectare by spraying at 400 L (litres)/ha as opposed to 2,000 L/ha.

It is difficult to comment accurately on pesticide savings in financial terms as growers use a range of products and not all need to be applied in a set amount of water.

Improving the uniformity of spray application will also impact on crop uniformity and quality, especially when applying plant growth regulators.

Action Points

- Evaluate crop protection product application equipment when planning new production facilities and investigate the installation of automated boom systems.
- Do not spray to run off; it is wasteful and increases the risk of pollution.
- As it was not possible to reset a Ripa spray pistol to deliver a repeatable result it is recommended and considered best practice to set the gun from fully open to a lower setting each time to minimise variability.
- Worn nozzles used in such a pistol increased the average droplet size and have been proved to increase the flow rate, therefore inspect and change nozzles regularly.
- Growers should aim to achieve a medium to fine spray quality when spraying protected ornamentals (**Table 1**).

- Increasing pressure increases the flow rate and the amount of crop protection product and water used; use the minimum pressure required to achieve the necessary spray quality. High operating pressures can also result in a very fine spray quality that is prone to drift, and fine droplets that will also evaporate rapidly which can be undesirable.

Table 1: Spray quality that was achieved with 'as new' 1.2 mm and 2.0 mm nozzles in a Ripa spray pistol at Silsoe at the various settings and pressures.

	Spray quality when twist grip on spray pistol set as shown below (pressure in bar shown in brackets).			
Nozzle size	Fully closed	Open 90º	Open 180 º	Open 270 º
1.2 mm	Medium to fine (2 – 4), Fine (3 – 10)	Medium (2 – 4), fine (4 and above.)	Medium (3 – 6), fine (7 and above.)	Medium (6 – 8), fine (8 and above.)
2.0 mm	Medium (2 – 8), fine (8 – 10)	Medium (4 – 10). Adjust gun to achieve a fine spray.	Medium (5 -7), fine (7 - 9)	Medium (6 -8), fine (8 – 10)