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 1: desk study)

Annual 2012

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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 the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

Project Number:	PO 008
Project Title:	Improving the efficiency of spray application for protected ornamental crops: a study of current spraying methods and novel spraying technologies (phase 1: desk study)
Project Leader:	John Buxton
Contractor:	ADAS UK Ltd
Industry Representative:	Colin Frampton & Russell Woodcock
Report:	Annual Report 2012
Publication Date:	03 January 2013
Previous report/(s):	None
Start Date:	01 February 2012
End Date:	31 March 2013
Project Cost:	£29,500

Headline

- The most common spraying system currently used by ornamental growers is inherently inaccurate, applies too much water and can lead to pesticide run-off.
- Methods to improve spray accuracy and reduce spraying costs are identified.

Background

Spraying methods have changed relatively little in ornamental horticulture over the last few years, whilst in other crops, including arable and fruit crops, there have been significant developments which have improved crop canopy penetration, reduced water volume applied and reduced drift. Many growers of protected ornamentals use a high volume trailed sprayer such as the Brinkman RIPA, coupled with a RIPA spray pistol which is difficult to calibrate and uses water volumes of 1000-5000 l/ha in contrast to an average of 100-200 l/ha in arable crops, where spray booms and nozzle systems are used. There is clearly potential to reduce the water volumes currently applied in ornamentals, with concomitant savings in chemical and labour costs.

This project reviewed a range of new developments in crop spraying technology in order to highlight those that have potential to be introduced to ornamental horticulture in the near future (phase 1). Follow up work will study aspects of current practice *in situ* on nurseries, to identify and quantify the range of factors, such as water volumes, pressures and settings on the RIPA pistol that are currently used by growers. These factors will then inform work using laser droplet spectrum analysers to evaluate combinations of pressure, nozzle diameter and setting on the twist grip most likely to give best droplet spread and penetration for ornamental crops. The biological effectiveness of treatments will not be addressed within the scope of this project.

The overall project aims are:

1. To improve the efficiency of spray application in ornamental crops;
2. To highlight novel technologies that ornamental growers can readily adopt.

The specific objectives are:

1. To review novel developments in crop spraying technology, including those in Europe, and identify those of greatest potential for use on ornamental crops (phase 1);
2. To gather data on current spraying practice and to assess the range of performance achieved when using the RIPA spray pistol;
3. To identify aspects of best practice and develop guidelines for adoption by growers.

Summary

Current methods used in the UK

The majority of protected ornamentals growers in the UK use trolley sprayers designed to apply pesticides diluted in water and applied under pressure via a spray pistol. One of the most common models is the Ripa model supplied by Brinkmans: www.brinkmans.com. This is infinitely adjustable using a twist grip to vary the droplet size and "throw" of the spray jet. A few growers use spray booms with conventional nozzles, but these are in the minority. For effective use of a boom system, the architecture of the greenhouse and the crop spacing and bed positioning needs to be considered, and can often be a limiting factor.

The main advantage of the spray pistol is its flexibility, and its ability to treat crops grown on benches or the floor, irrespective of the architecture and crop spacing of the greenhouse or tunnel. However, there are many disadvantages of the spray pistol, including the high pressures needed (20-30 bar); difficulty with calibration; uneven application; high volumes of water required and ineffective crop coverage. If the setting on the twist grip of spray pistol is adjusted for a very fine spray cloud, operators may be exposed to more spray mist, with associated hazards, and so full PPE is required when using it in this manner.

Water volumes applied by growers using this system vary from 750 - 5,000 l/ha, depending on the crop and grower concerned. For instance, low growing bedding plants may only require 750 l/ha, whereas a well grown poinsettia crop, which needs application in two passes, up and down the bench, may require 5,000 l water/ha. Obviously, with a high volume rate for any pesticide, the higher the water volume, the longer application takes, and so labour costs increase. If the pesticide is applied at a set concentration rather than a quantity per unit area, more pesticide is needed at high spray volumes. Thus, the total costs per hectare treated can become very high with spray pistol application systems.

The Ripa spray pistol is the main model used by UK growers, and it is normally supplied with a 2.5 mm nozzle. A similar type of spray pistol, which is also adjustable via a twist grip, is the Alumax, supplied by CMW Horticulture: (www.cmwhorticulture.co.uk/pestdisease.htm).

When questioned, many growers were unaware of the fact that the Ripa spray pistol can be supplied with nozzles of various sizes from 1.0 mm up to 2.5 mm (Table 1). These nozzles are easy to exchange and can reduce the water volume used cheaply and easily. This fact

alone, if better publicised, could save growers time and money by substituting a smaller nozzle in their existing spray pistol.

Research findings on current practice

Extensive studies in Europe (e.g. Foque *et al*., 2012) have shown that boom systems, either hand held, or automated boom or gantry type systems, apply pesticides more evenly, using lower pressures, can achieve better underleaf coverage and result in less operator exposure than hand held spray pistols or lances such as the Ripa pistol.

Surveys of agricultural sprayers, using conventional spray booms and either cone or flat fan nozzles (Basford, 2012) showed that the range of pressures used varied from 2-4 bar and the water volume applied ranged from 100-200 l/ha. For a few specialised operations such as potato haulm destruction, as much as 600 l/ha was used, but this was exceptional.

Therefore, in protected ornamental horticulture, between 3.5 and 25 times more water per hectare is used to apply pesticides than is currently used in arable systems. There is clearly scope to reduce this major discrepancy in the future. Vegetable growers also use higher water volumes than arable applications, but even here the maximum volume (applied using tractor mounted spray booms and special nozzles) is unlikely to exceed 800 l/ha. (Syngenta crop protection leaflet, 2012).

Novel nozzles and spraying systems

There are many new spray nozzles designed to fit spray booms, including air inclusion, twin air nozzles, and the new Syngenta vegetable nozzle. However, they are not practical for ornamental growers to use unless they change from the spray pistol to a boom based system. For this to be possible, however, bed spacing would have to be adjusted to allow access for spray operators. This has been done by some growers (see illustration figure 4), but inevitably space for cropping is reduced due to the need for pathways at regular intervals. Completely novel spraying systems include the Electrostatic (ESS) system, the Micothon air assisted semi automated system, automatic spray booms from Visser, the Degramec spray cabin, ULV based systems such as the Micronair and the robotic sprayer from CMW horticulture. Details of these systems are given in the main body of the report.