Options for low volume spraying of winter wheat

Why use low application volumes?
Timeliness significantly influences pesticide performance. Work rates for a given field spraying system are influenced by:

- filling/loading cycle
- sprayer forward speed
- boom width

and above all, application volume.

Figure 1 shows that reducing water volume is a critical factor in increasing work rate for a given sprayer. However, applying low water volumes through conventional hydraulic pressure nozzles fitted to boom sprayers may increase drift when spraying at higher forward speeds and/or using lower throughput nozzles.

Most product labels recommend application at 200L/ha. Often products can be sprayed at lower volumes; however, in some instances this may contravene the Code of practice for using plant protection products, known as ‘The green code’.

The performance of many products will be similar, or even improved, at 100L/ha compared to 200L/ha. Some products, e.g. some protectant fungicides, may perform less well at the lower volume.

Spray coverage using low volumes
Coverage is defined as the percentage of treated surface area that has a chemical deposit.

The amount of spray deposited on artificial and grass weed targets was measured in laboratory and field experiments. Two air induction nozzles giving either relatively large, or small, droplets were compared with conventional, twin-fluid and controlled droplet application systems.

Coverage differed little with nozzle type but increased with application volume with all systems. There was no relationship between coverage and efficacy when using volumes of 80L/ha or more. This suggests that the distance between individual deposits may be more important than overall coverage; efficacy may be reduced when deposits are widely spaced (Figure 2).

Figure 2. Average inter-deposit distance and its variability are likely to be more important than percent area covered for product efficacy

- Deposits from a large droplet air induction nozzle
- Deposits from a small droplet air induction nozzle

Action
Check manufacturer’s information to ensure that product can be applied:
- at volumes lower than the minimum specified on the label (see PPP Code, 4.6.4)
- to satisfy legal requirements.

Assess the extent to which using low application volumes can improve work rates.

Choose an appropriate nozzle for the target and to reduce drift risk [see Nozzle selection chart (2007)].

Always check with your pesticide adviser before using water volumes below those recommended on the product label.

Always consider your local conditions and consult a BASIS-qualified agronomist if necessary.
Spray deposits using low volumes

Spray deposit is defined as the total weight of active ingredient that can be recovered from a sprayed surface such as a crop leaf.

Total deposits, particularly on upright targets, tended to increase as application volumes reduced.

The variability of deposits increased as application volumes reduced, especially when air induction nozzles that deliver the largest droplets were used. This was particularly so when the target was small, for instance a small weed.

Note that air induction nozzles from different manufacturers with nominally the same specification can deliver very different droplet sizes and this will influence performance.

Low volume herbicide application

Principles of low volume application were demonstrated in field trials over four seasons (2002/03 to 2005/06) using tralkoxydim (“Grasp”) with an adjuvant (“Output”) to control Italian ryegrass in winter wheat. Application volumes were 37-164L/ha. Air induction nozzles tested, all with the same throughput, represented those at the ‘finer’ and the ‘coarser’ ends of the droplet spectrum.

Weeds had at least three leaves when applications were made. No differences in control were found between standard flat fan nozzles and air induction nozzles, probably because weeds were relatively large. Another project, using foliage-acting herbicides to control smaller weeds, showed that standard flat fan nozzles gave superior weed control, particularly compared to ‘coarser’ air induction nozzles.

Low volume fungicide application

A mixture of a triazole and a strobilurin was applied at the flag leaf stage to control Septoria tritici. Conventional flat fan, as well as finer- and coarser-sized droplet air induction nozzles were tested at 25L/ha to 200L/ha over three seasons.

Because the cereal plants were large targets, the nozzles used had a similar effect on disease control at any given volume.

In all years, efficacy at 100L/ha was at least as good as at 200L/ha; in some cases it was improved. Coverage is not critical, provided that deposits are well distributed on and between the targets. In a year with high disease pressure, eg 2005, better control was achieved at 100L/ha than at 25L/ha. Disease control correlated well to yield.

With all treatments highest yields tended to be at 100L/ha (Figure 3).

Efficacy with low volumes

Though coverage increases with increasing volumes, product efficacy is not always improved. For many sprays applied to cereal crops, deposit uniformity is more important for efficacy and coverage less so. Some manufacturers publish lists of products and doses that can be used at volumes lower than those specified on the label based on their own risk assessments.

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Overview

Pesticide application at low volumes can significantly increase work rates. A recent Defra-sponsored LINK research project co-funded by HGCA, Syngenta Crop Protection UK Ltd, The Voluntary Initiative, Billericay Farm Services, Cleanacres Machinery Ltd, Hardi Ltd, Hypro EU Ltd and Micron Sprayers Ltd examined effects of low application volumes on both efficacy and drift. The work was carried out by Silsoe Research Institute (SRI) from 2001 to 2006 (the Institute closed in 2006) and TAG.

Highlights

This work indicates some potential to apply both herbicides and fungicides using reduced, but not very low, water volumes. In general, good results were obtained using from 80L/ha to 100L/ha. New nozzle types, particularly air induction, should reduce spray drift. Uniformity of deposit, rather than coverage, is often the most important determinant of efficacy when low volumes are applied.

Further information

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Project Reports 317, 408

Nozzle selection chart 2007, HGCA


Pesticides and Cross Compliance http://www.pesticides.gov.uk/approvals.asp?id=2064

Efficient Spraying – a Best Practice Guide www.voluntaryinitiative.org.uk

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