



**SPRAY APPLICATION MANUAL FOR GRAIN GROWERS**

**Module 21**

**Assessing spray deposits**

A way to improve spray applications

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**Bill Gordon**

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## Key points

- Simple tools and techniques are available to show spray applicators where the spray is landing and to allow the spray coverage to be measured. This allows for comparisons to be made and results to be kept for future reference.
- Making assessments of spray coverage allows the operator to compare the impact of changes to the sprayer set-up and to make adjustments to suit the target and the product where required.
- Keeping records of the spray coverage achieved using various set-ups will help spray operators to continually improve their sprayer set-up and the results of their spray applications.

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## 1. Introduction

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► For more information on product uptake and translocation go to Module 2: Product requirements

Getting the best out of each crop-protection product requires that the spray droplets are deposited in sufficient numbers at the right location, and at the right time in the pest, weed or disease life cycle.

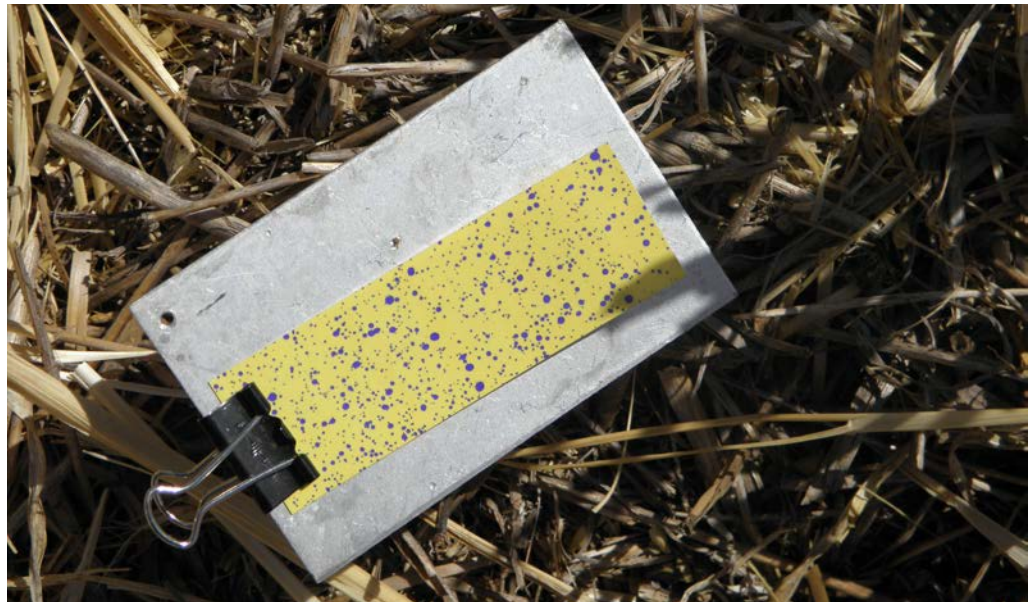
Knowing where the droplets need to land requires knowledge of the target (e.g. plant structure and characteristics of the leaf surface), as well as an understanding of how the product translocates once the droplets have deposited onto the plant or leaf surface.

Knowing where the droplets should land is the starting point for any spray application; successfully achieving this can be difficult without being able to make an assessment of where the droplets are actually depositing.

There are several simple techniques and tools available to help the spray applicator to assess where sprays are depositing. These include:

- **evaluating the level of control (efficacy) after each spray job – this can work particularly well when using fast-acting contact herbicides, such as paraquat;**
- **using coloured dyes, which can indicate where the spray has been applied;**
- **the use of fluorescent dyes and blacklight ultra violet torches or lamps, which makes it easier to see where small droplets (not visible using coloured dyes or that may not leave a stain on water-sensitive paper WSP) have landed; and**
- **using artificial collectors such as WSP, which can be placed at various locations in the crop canopy, on the soil or within standing stubble where the droplets need to deposit.**

### Using water-sensitive paper to show spray coverage



Water-sensitive paper can highlight droplet density and uniformity. The actual coverage can be measured to compare sprayer set-ups. ►

Source: Bill Gordon

The technique selected will depend on the amount of time and money the applicator is willing to invest in assessing his or her spray coverage. The return on the initial investment for assessing spray coverage can far outweigh the expense of conducting the tests, particularly if this process provides the operator with information that will improve their sprayer's set-up or how they operate the machine.

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## 2. Assessing the results of spray jobs

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The fastest and generally least expensive way to assess if adequate spray coverage has been achieved is to carefully assess the results of an actual spray job. The most obvious results can be seen when using a fast-acting contact herbicide, such as paraquat.

If there is an issue with the sprayer set-up, often there will be a pattern that is repeated at particular locations throughout the sprayed area. Before starting an assessment of the results of a spray job it is very useful to have a copy of the spray record of the actual job available. This way, information about the application parameters and the weather conditions (especially wind direction) can assist in determining the source of potential problems.

The following suggestions have been provided to assist applicators and advisers when evaluating the results of various spray jobs.

### **Always look at several locations across the paddock**

Ensure that the areas that are chosen to assess the level of control are representative of the possible variability in soil type, drainage or other agronomic factors that may be present in a paddock. Where there are apparent differences in the level of control obtained, it is important to work out whether this is due to an agronomic factor or an issue caused by the spray application.

### **Examine multiple sets of wheel tracks across the paddock, including those going in both directions of travel**

Compare the level of control obtained in the centre of the wheel tracks, adjacent to the wheel tracks, at the mid-point of the boom on each side of the sprayer, and at the boom ends to ensure sufficient overlap between spray passes.

For herbicide applications into standing stubble also compare the level of control in the inter-row and at the base of the standing stubble (to evaluate stubble penetration). This should also take into account the direction of travel and the wind direction at the time of spraying, noting if reduced control is consistent in particular locations that can identify the source of the problem.

Coarser droplets tend to be affected by travel speed, moving with the direction of travel. Smaller droplets, such as medium and fine spray qualities, tend to be more affected by the wind direction and wake effects in the centre of the sprayer.

For assessing the level of control onto larger weeds, also compare levels of damage caused by the herbicide on various sides of the weed in relation to the direction of travel and the wind direction.





The thistle in this image was sprayed with a phenoxy herbicide. The damage to only one side of the plant indicates the plant must have been very stressed when sprayed and the droplets landed mostly on that side of the plant (with the direction of travel of the sprayer). ►

Source: Simon Rodgers

### The impact of spraying with a very coarse spray quality at 33km/h



### Compare areas of low spraying speed with areas where the average spraying speed has been maintained

Carefully look at the ends of the spray runs, areas within the headland and areas just outside of the headland where the sprayer has commenced a new spray run.

For most sprayers that utilise a standard rate controller the pressure at the nozzle will decrease as the sprayer slows down. This will tend to increase the droplet size, causing the spray quality to become coarser. Where pressure becomes too low, this may also reduce the angle of the spray pattern, which may lessen the overlap of the spray patterns. Both of these outcomes may lead to reduced levels of control in locations where the sprayer has travelled at lower speeds without a minimum setting in the controller to maintain pressure at the nozzle.

Where a minimum hold has been set in the rate controller, this can lead to overdosing in the areas of lower spraying speeds. This may be observed through increased damage to the crop with some selective herbicides, or as areas of poorer crop establishment when higher rates of residual herbicides have been applied.

Where wider headlands have been used, crop damage, poor establishment or poor control may be the result of incorrect timing of auto section control or nozzle shut-off. This is likely to be visible close to the edge of the headlands (where used) and in locations where the sprayer enters an area that has already been treated.

Where overdosing leading to crop damage has occurred (due to the minimum hold being engaged or set to remain at too high a speed or pressure), this may be visible across the entire headland.

In areas where poor weed control has occurred as a result of reduced coverage (due to no-minimum setting in the rate controller), this tends to be noticeable outside of the headland into the sprayed paddock, particularly where narrow headlands have been used, or from the edge of the paddock when no headland has been sprayed (e.g. some furrow irrigated blocks).

Where operators typically spray headlands at lower speeds than the rest of the paddock it may be worth considering applying the tank mix to the headland at a slightly higher application volume to maintain the pressure at the nozzle. This would require preparing a separate tank mix to be applied at the higher total application volume than the rest of the paddock, but this strategy may help to minimise overdosing or reduced coverage due to lower pressure at the nozzles.

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### 3. Adding coloured dyes to the tank mix

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There are a number of coloured dyes, such as those used for foam markers, that can be added to water or a tank mix to show where a spray has deposited. Such dyes are commonly added to herbicides for spot spraying to show which plants have been sprayed.

Coloured dyes may also be useful for assessing the functioning of auto section control, to ensure the 'look ahead' function is working correctly, or as a rapid check for assessing when target-selectable sprayers are turning the nozzles on and off. This can be very effective for assessing applications into standing stubble, where the coloured dye is easy to see. However, many of the commercially available coloured marker dyes may not be suitable for determining where individual droplets have landed, or provide a useful guide to assessing the number of droplets that have deposited onto the target or the droplet density.

Some of the commercially available coloured dyes that are designed to show where herbicides have been applied may not be suitable for use on food crops as they may contain toxic substances. It is important for the applicator to read the directions for use for each product and to access the safety data sheet before using a marker dye for assessing in-crop spray applications.

To assess actual spray deposits onto crops using a dye or pigment it is best to use water-soluble, non-toxic products. Even for non-toxic dyes the label instructions must be followed to avoid potential contamination of plant foliage intended for human consumption.



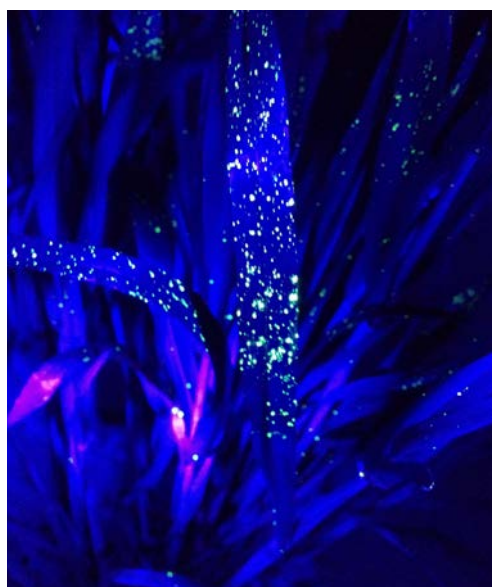
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## 4. Fluorescent dyes and black light

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There are commercially available, water-soluble, non-toxic fluorescent dyes that can be used to assess where sprays have deposited. Fluorescent dyes can highlight where individual droplets have landed within the crop, into stubble or onto the soil. To be able to see the individual droplets requires the use of a black light ultraviolet (UV-A) torch or hand-held UV-A lamp that causes the individual droplets to glow in the dark.

### Fluorescent dye applied to wheat



Fluorescent dyes and black light torches can highlight where individual droplets have landed in various parts of the plant and onto soil. ►

Source: Bill Gordon

One of the benefits of assessing spray droplets on an actual plant is the ability to see where the spray droplets have landed. Quite often droplet movement will be influenced by the size and shape of the plant and the individual leaves, which can be difficult to replicate using artificial collectors such as water-sensitive paper.

Fluorescent dyes can also be useful for evaluating how thorough a decontamination procedure has been and for training staff on safe mixing procedures.

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### 4.1 Useful comparisons that can be made using fluorescent dyes and UV-A light sources

#### Assessing penetration into crop canopies and standing stubble

Changes to the nozzle type and design, spray quality, total application volume, pressure at the nozzle, boom height, spraying speed and wind speed at the time of spraying can all influence how far into the crop canopy droplets may penetrate.

Penetration can be particularly important when applying some fungicides to prevent or control diseases that may establish on the lower parts of crop plants.

When assessing the impact of any changes to the set-up of the sprayer on penetration into the crop canopy, it is a good idea to only change one thing at a time, trying to keep all other factors as constant as possible. Always try to compare like with like. For example, when assessing the impact of increasing the application volume, try to do this with nozzle types that produce the same spray quality at a similar pressure; this way you are comparing the effect of total application volume, not other factors. A similar approach can be taken to assessing the impact of spraying speed or spray quality (droplet size).

### Assessing spray coverage and droplet density on various parts of the plant

One advantage of using a fluorescent dye is the ability to look at where the spray droplets have deposited on different parts of the plant. Using a black light UV-A torch, the coverage of the entire plant can be evaluated. This technique allows the applicator to look at the undersides of leaves, vertical stems and the ground, all at the same time. Using knowledge of where the product needs to land, along with knowledge of which sprayer set-ups can maximise the spray deposits in these locations, will improve application results.

### Limitations of fluorescent dyes

Fluorescent dyes are useful for determining where droplets are landing. However making direct comparison of spray coverage will generally require the applicator to make ratings or rankings of the coverage in the field (in the dark) and record these for future reference, as it can be difficult to capture clear images in the field.

The main drawback with this technique is the temporary nature of water-soluble dyes and pigments, as the assessments of coverage need to be made relatively soon after application to avoid dew or rain washing the dye off the plants. Working in the dark can also create its own issues, unless plants are removed from the field and assessed in a darkened room or area.

### Where to obtain fluorescent dyes

One of the best fluorescent dyes available was developed by the South Australian Research and Development Institute (SARDI) and can be obtained through select retail outlets that specialise in spray application equipment and components. The SARDI dye can also be purchased online (see left).

Fluorescent dyes may seem expensive to purchase. Obtaining enough fluorescent dye to treat an area up to one hectare may cost more than \$150, depending on the size of the container purchased. Before purchasing or using the dye the spray operator needs to carefully plan what comparisons are going to be made and maximise the number of comparisons that can be made from one tank mix. Before starting the application, it is important to have all of the equipment required on hand, such as extra sets of nozzles.




► SARDI's fluorescent dye can be purchased through Croplands agents or online at: [www.sprayshop.com.au/sardi-fluorescent-dye-l-m111/](http://www.sprayshop.com.au/sardi-fluorescent-dye-l-m111/)

### Where to obtain UV-A torches or lamps

For use in the field, spray applicators can obtain light-emitting diode black light UV-A torches relatively cheaply or by searching online for suppliers. UV-A torches are useful for looking at individual plants, however they may not illuminate a large enough area to compare several plants at a time.

Specialised handheld lamps and floodlights (e.g. the 'Lambino' lamp), which are able to illuminate much larger areas in the field, can also be purchased. However, these are typically too expensive for individual spray operators to consider purchasing. Lambino lamps normally have to be purchased from specialist distributors of UV light sources or through scientific equipment suppliers. It may be possible to access one on loan via chemical company representatives or machinery dealers, or for a grower group to purchase one to be shared between group members.

 SARDI fluorescent pigment and black light torch. ►

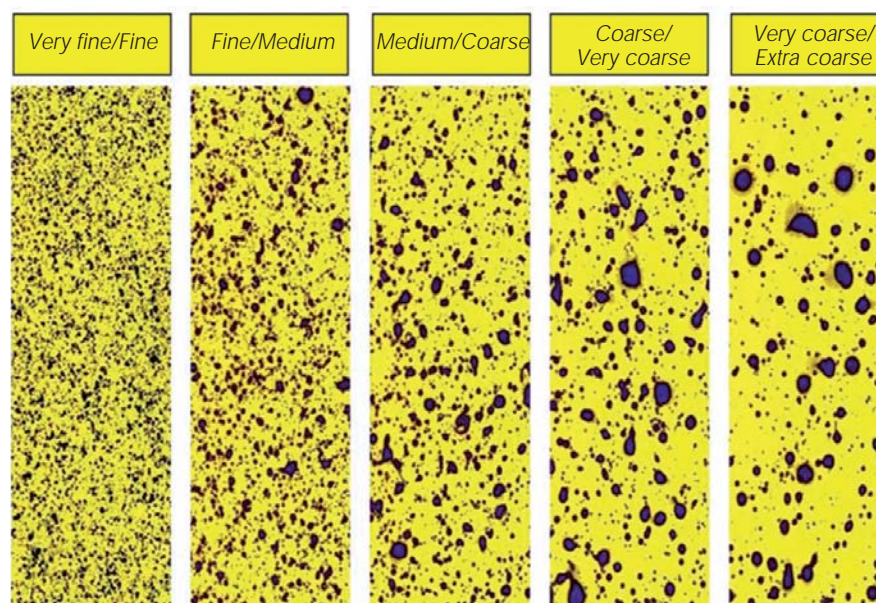
Source: Croplands



## 5. Water and oil-sensitive paper

Water sensitive paper (WSP) is a resource that has been available to spray applicators for many years. WSP is thick paper with a special coating that produces a stain when a droplet lands on it, which allows spray applicators to assess spray deposits.

**Figure 1** Water-sensitive paper illustrating various spray qualities at the same application volume



Source: Tom Wolf,  
Agriculture and Agri-Food  
Canada.

Before the advent of image-analysis tools that could read WSP, spray applicators relied on visual assessments of the spray deposits and basic counts of the number of droplets per square centimetre (droplets per  $\text{cm}^2$ ) landing on the cards to be able to compare spray set-ups. While this is useful for determining if spray is depositing where it is required, it does not always provide a useful measurement for determining which set-up may be providing better coverage.

The difficulty with counting droplets per  $\text{cm}^2$  to determine if spray coverage is adequate is that it is only useful to compare similar droplet sizes, e.g. a medium spray quality with a medium spray quality. It becomes much more difficult to usefully compare 40 coarse droplets per  $\text{cm}^2$  to 40 medium droplets per  $\text{cm}^2$ , as the amount of product deposited onto the target can be totally different.

Assessing the percentage covered on the WSP allows comparisons between different spray qualities and droplet sizes to be made, provided the WSP is placed where the droplets need to land and that the droplets themselves are able to deposit and remain on the WSP as they do on the intended target.

WSP is available in several sizes and the most common size used is 76 x 26 millimetres, which comes in a pack of 50. The purchase price may be up to \$2 per card (depending on where they are purchased), so it is important to plan how you are going to use them.

### 5.1 Measuring spray coverage on WSP using the SnapCard app

There is a lot of information that can be collected by taking measurements of spray coverage in the field using WSP, so spray applicators need to think about not only the comparisons they wish to make, but also how to measure, record and store the data they obtain.

Collecting a set of benchmarking data is a good place to start. Collecting spray coverage data based on how sprays are currently applied provides a basis for comparison when considering making changes to parameters in the future, or if the results highlight poor coverage for certain spray jobs.

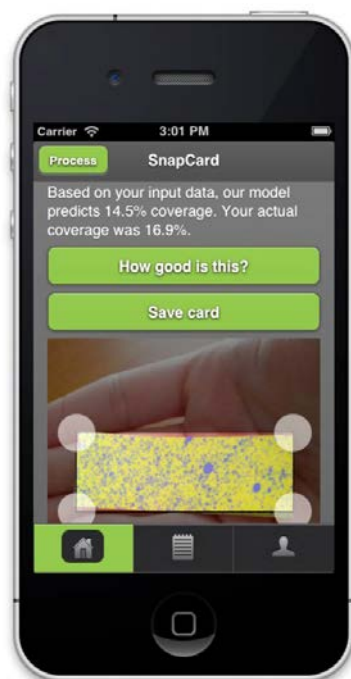
Many growers have started to develop spray application guides for their own machine, photographing the WSP cards and recording the percent coverage for each set-up they use, as well as recording the impact of changing parameters such as pressure, application volume or travel speed. Over time this information becomes a valuable tool, especially when the information in the spray records allows for direct comparison between how the application was made and the results that were obtained.

#### The SnapCard app

The SnapCard app is the outcome of a research collaboration between the Department of Agriculture and Food, Western Australia, entomology group and the University of Western Australia's applied entomology program that was supported by funding from the Council of Grain Grower Organisations.



► The SnapCard app instruction manual can be downloaded from [agspsrap31.agric.wa.gov.au/snapcard/#manual](https://agspsrap31.agric.wa.gov.au/snapcard/#manual)



The SnapCard app has been available as a downloadable app for both Android and IOS devices since 2014, and its use by growers and spray operators to measure spray deposition has continued to increase.

The SnapCard app has many useful features that spray operators can use to predict and measure spray coverage on WSP. Predictions in the app are based on agronomic variables, weather conditions and sprayer set-up and serve as a useful guide to compare actual measurements with. But its most powerful function is the measurement tool, which provides the user with a measurement of the percentage of WSP covered.



### Accuracy of the SnapCard app

In a recent University of Queensland study comparing some of the image-analysis systems available to measure spray deposits, results obtained from the SnapCard app were in general agreement with larger, laboratory-based equipment, which is often expensive and difficult to use in the field.

A selection of the results obtained from this study (Table 1) shows the percent coverage on WSP as measured using a range of image-analysis systems. The nozzles and operating pressures used in this study were the American Society for Agricultural and Biological Engineers (ASABE) reference nozzles, which determine the spray quality classification for nozzles according to the standard ASABE S572.1.

While the estimates of percentage coverage measured with SnapCard were marginally lower for the 110-01 nozzle outputs than those measured by other instruments (Table 1), there was strong agreement with other instruments for the range of droplet sizes that are likely to be used by Australian grain growers.

**Table 1** A selection of the data produced comparing the percent coverage measured by four of the image-analysis systems tested.

Nozzle used	Operating pressure (kPa)	Percent coverage on water-sensitive paper (WSP)*			
		SnapCard	Image J	Deposit Scan	Droplet Scan
110-01	450	49	60	60	75
110-03	300	49	53	53	71
110-06	200	51	53	52	75
80-08	250	43	44	43	50
65-10	200	48	50	49	65

\* As this is only a selection from the original data set the levels of statistical significance are not included.

Source: University of Queensland Centre for Pesticide Application and Safety. Modified from an article (in press) by Ferguson, JC et al (2016) *Pest Management Science*.

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## 5.2 Tips for getting the best results with WSP using the SnapCard app

- Download the SnapCard instruction manual  
<http://agspsrap31.agric.wa.gov.au/snapcard/#manual>
- WSP is available through TeeJet distributors, such as machinery dealers.
- Always use disposable gloves when handling WSP as fingerprints can produce a stain on them.
- Do not use WSP when the relative humidity is above 70 to 80 per cent, as the cards will turn blue. Place out a single test card to assess this before starting any trial.
- Consider the position of the WSP cards in relation to the sprayer. It is a good idea to set an A-B line for the sprayer, or use established wheel tracks, and then place pegs in the ground where the cards are located. Even in fallow the WSP cards can be hard to locate.
- Place several cards out at each location you wish to collect coverage data from. After the measurements of spray coverage are completed, record an average for the group of WSP cards at that location.
- Allow the cards to fully dry before collecting them.
- Label the back of each card with a pencil for future reference and store them separately in snap-seal bags to avoid exposure to moisture or humid conditions.
- After collecting all of the WSP cards, go to a place out of the wind where you can use SnapCard to capture images of the WSP cards and record all the results at one time, keeping the smartphone camera at a constant distance from the WSP cards, and under uniform light conditions.
- Once all the WSP cards have been measured with the SnapCard app, they can be photographed or glued to a sheet of paper and scanned. It is a good idea to include details of each treatment and the sprayer set-up used in the photograph or scan.
- Keep the results of all of your tests in one book or folder for future reference, making sure you record all of the application parameters and conditions for each test.

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## 5.3 Situations where assessing spray coverage with WSP can identify areas of improvement

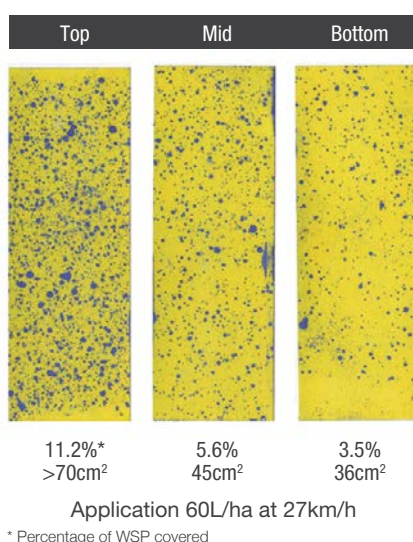
Many applicators may not have considered the number of situations where an accurate measurement of coverage could be useful for improving the sprayer set-up. While the following examples may not include every possible use of WSP, they do provide a useful guide for how to look at specific situations.

### 5.3.1 Assessing penetration into crop canopies

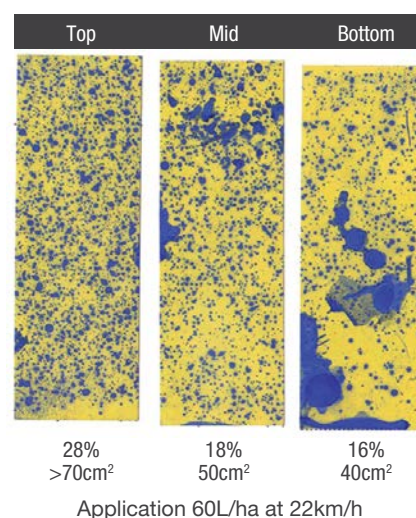
Placing WSP cards directly onto the crop canopy using staples or paper clips at various heights throughout the canopy can demonstrate how much penetration into the canopy can be achieved using different application parameters.

The images in figures 2 and 3 and 4 and the summary in Table 2 are from an example of using WSP and the SnapCard app provided by Bill Campbell of Farmanco Consultants in Western Australia. Figures 2 and 3 show the difference in coverage on WSP cards that a change in spraying speed with the same nozzles can produce in a late canola canopy, with the results summarised in Table 2.

**Figure 2** Deposits onto WSP cards at three locations in the canopy (top, mid and bottom).



**Figure 3** Deposits onto WSP cards at three locations in the canopy (top, mid and bottom).



Source: Bill Campbell

**Table 2** Summary of spray coverage at three positions in the canopy (top, mid and bottom) at two spraying speeds.

Parameters to achieve 60L/ha		Top	Mid	Bottom
27km/h 2.3 bar	Coverage	11.2%	5.6%	3.5%
	Droplets per cm <sup>2</sup>	80	45	36
22km/h 1.7 bar	Coverage	28%	18%	16%
	Droplets per cm <sup>2</sup>	120	50	40

Source: Bill Campbell

### 5.3.2 Assessing spray deposits into standing stubble

To assess if the sprayer is set up to provide good spray deposition into standing stubble requires a comparison to be made between the spray deposits in the inter-row space and at the base of the standing stubble (within the stubble row). If a sprayer set-up can produce good spray coverage that is equivalent between the two locations, it generally indicates that the spray operator has selected an appropriate spray quality and application volume for stubble load and the spraying speed tested.



It is important to assess spray coverage at the base of the stubble, as this is an area where weed control can be difficult. ►

Source: Bill Gordon



### Assessing deposition in fallow and wheel tracks

## Placement of water-sensitive paper for assessing fallow sprays



### 5.3.3 Determining wake effects and wheel-track issues

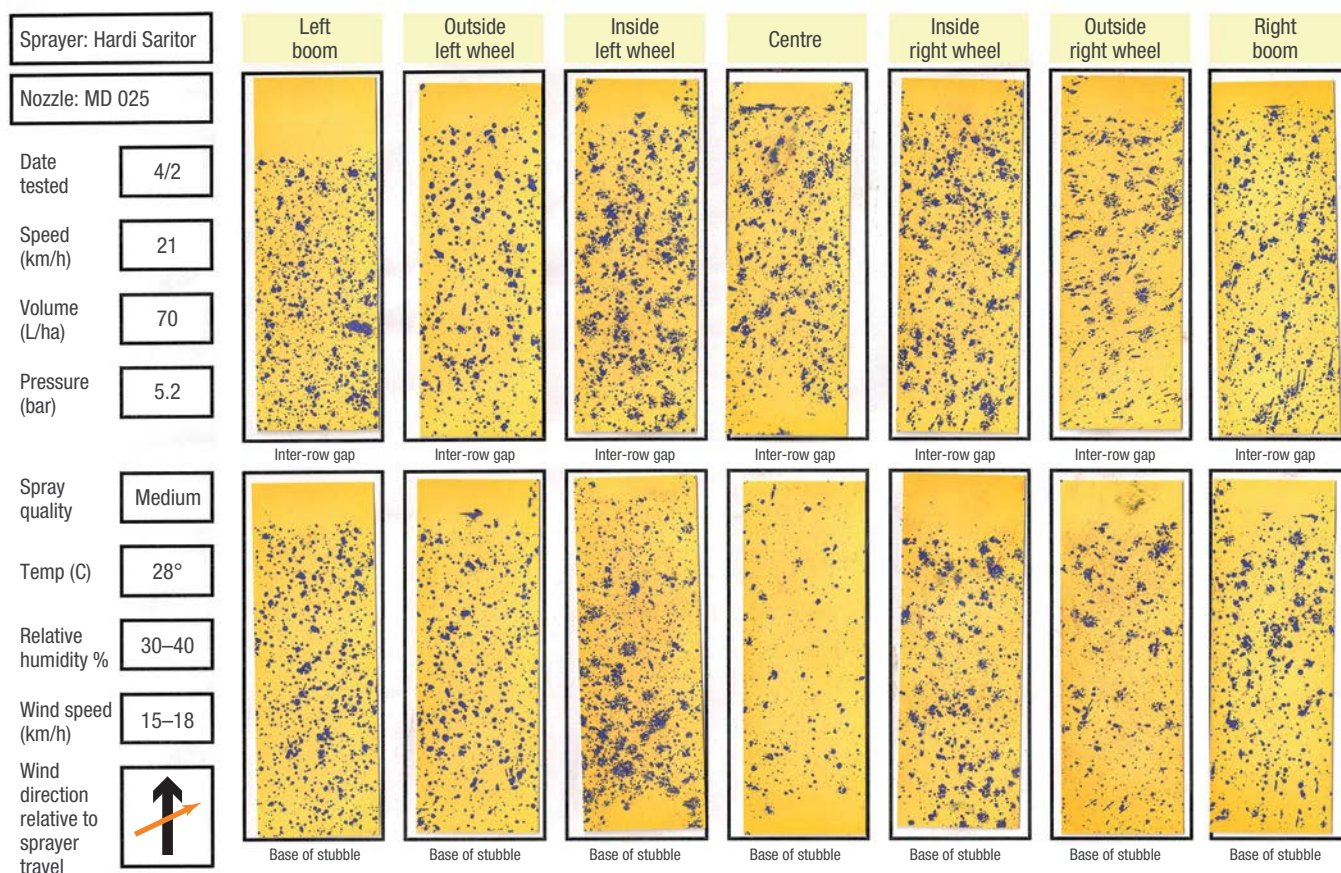
Placing WSP cards at different positions across the boom sprayer allows spray operators to look at the impact of changing travel speed on the amount of spray that deposits in the centre of the sprayer, adjacent to the wheels and out under the boom. This information is useful for looking at wheel-track issues and adjustments that can improve coverage.

Generally, when the spray deposits onto the WSP cards located in the midpoint of the boom are similar between the inter-row and the base of the stubble, the operator has selected a useful spray quality. If this has been achieved, then the depositions at other locations can be assessed.

Figure 4 shows the spray deposits onto WSP across the boom for a Hardi self-propelled sprayer travelling at 21 kilometres per hour. The upper row of WSP cards show the deposition into the inter-row gap, and the lower row of WSP cards show the deposition at the base of the stubble at the same locations.



**Figure 4** WSP can be used to highlight differences in the spray deposits into standing stubble at different locations across the sprayer.



Source: Bill Gordon

Placing water-sensitive paper cards in the inter-row and at the base of the standing stubble can highlight areas of poor deposition due to the wake effect. Figure 4 shows poor deposition in the centre of machine at base of stubble resulting from small droplets being transported upwards behind the machine.

Note that the deposition under the left and right booms is very similar for the base of the stubble and the inter-row, and that the coverage obtained with the Minidrift 025 is very good at 70 litres per hectare. However, we can also see that the coverage at the base of the stubble in the centre of the machine is lower than other locations. This can indicate that the travel speed may be creating a wake effect behind the sprayer, displacing some of the smaller droplets. Where this effect is visible, it would be advisable to conduct another test at a lower spraying speed (maintaining a similar droplet size and pressure), or in a different direction of travel to see if the problem still remains.

#### 5.3.4 Evaluating the impact of duty cycle on spray coverage with pulse width modulation

Placing the 76mm-long WSP cards at regular intervals, usually with a 24mm gap between them, onto strips of timber that are at least one-metre long can highlight possible coverage concerns if the duty cycle of a pulse width modulation (PWM) system is too low to provide even coverage.



### Placement of water-sensitive paper to evaluate the impact of low duty cycle for PWM systems

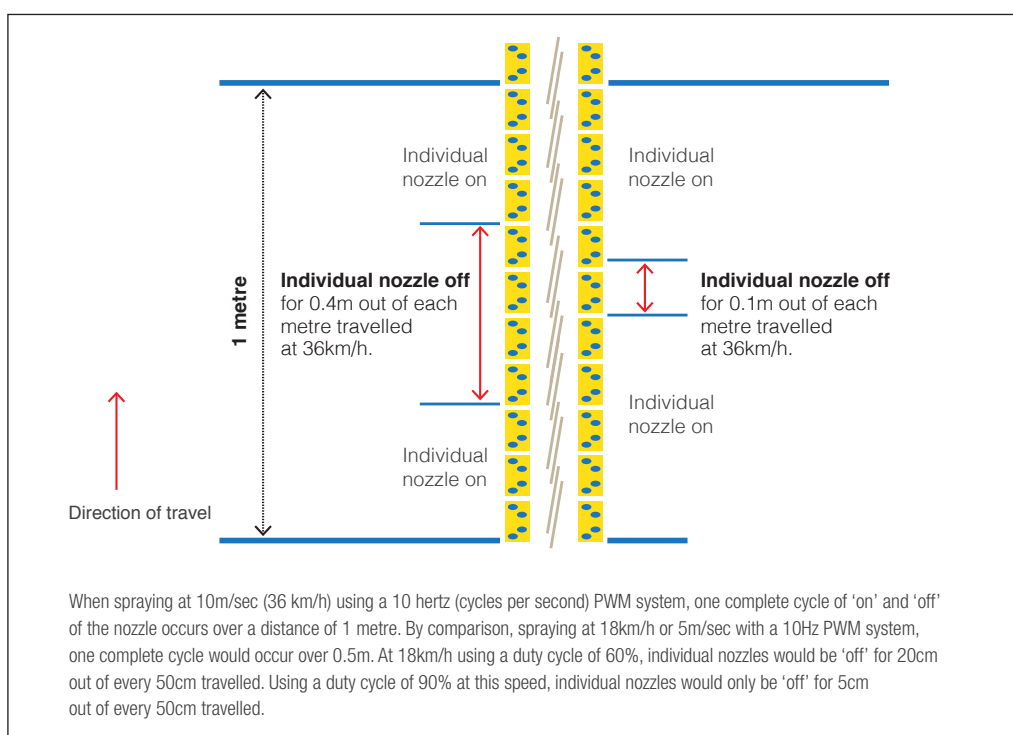


Measuring the coverage achieved as the sprayer passes over the ground can highlight when low duty cycles may result in poor spray outcomes. ►

Source: Bill Gordon

Aligning the strips of timber with the direction of travel and spraying at different speeds can show the impact of low duty cycles, particularly with coarser spray qualities. Figure 5 highlights the potential impact on spray coverage that can occur due when the duty cycle of a PWM system is reduced and the droplet size is large (e.g. a coarse to very coarse spray quality).

**Figure 5** Representation of spray deposits from a single nozzle onto water-sensitive paper aligned with the standing stubble, using a 10Hz PWM system at either a 60 per cent duty cycle or a 90 per cent duty cycle, using coarse droplets and spraying at 10m/sec (36km/h)

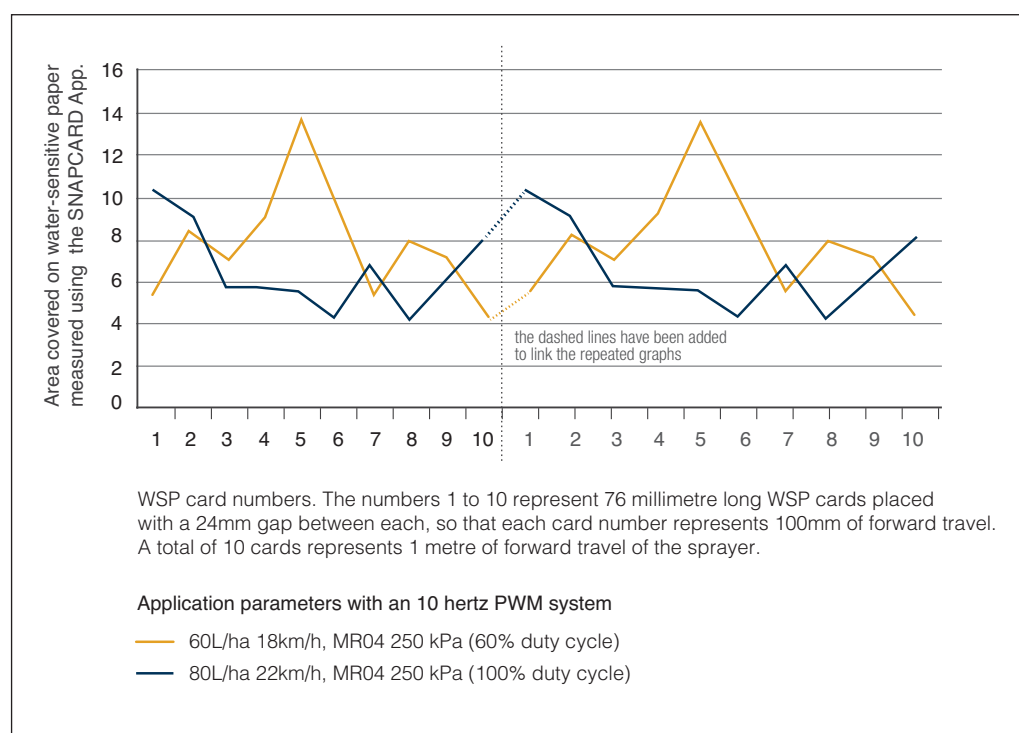


Source: Bill Gordon

Note that the distance travelled for one complete cycle of 'on' and 'off' will change if the PWM system is designed to operate at a higher frequency (cycles per second) or hertz. Many current systems operate at 10 hertz, whereas future systems may operate at closer to 30Hz. For a 30Hz system the distance travelled for one complete cycle will be three times less, this offers the opportunity for improved coverage and fewer potential 'skips' or misses.

Figure 6 shows the results of actual measurements of area covered on WSP cards using the SnapCard app for two passes of a 10Hz PWM system, one at 60L/ha (60 per cent duty cycle) and the other at 80L/ha (close to 100 per cent duty cycle).

**Figure 6** The area covered on water-sensitive paper, aligned with the standing stubble, measured over 1m of forward travel for 2 application volumes and duty cycles using a 10Hz PWM system (with the pattern of deposition repeated by transposing the graph).

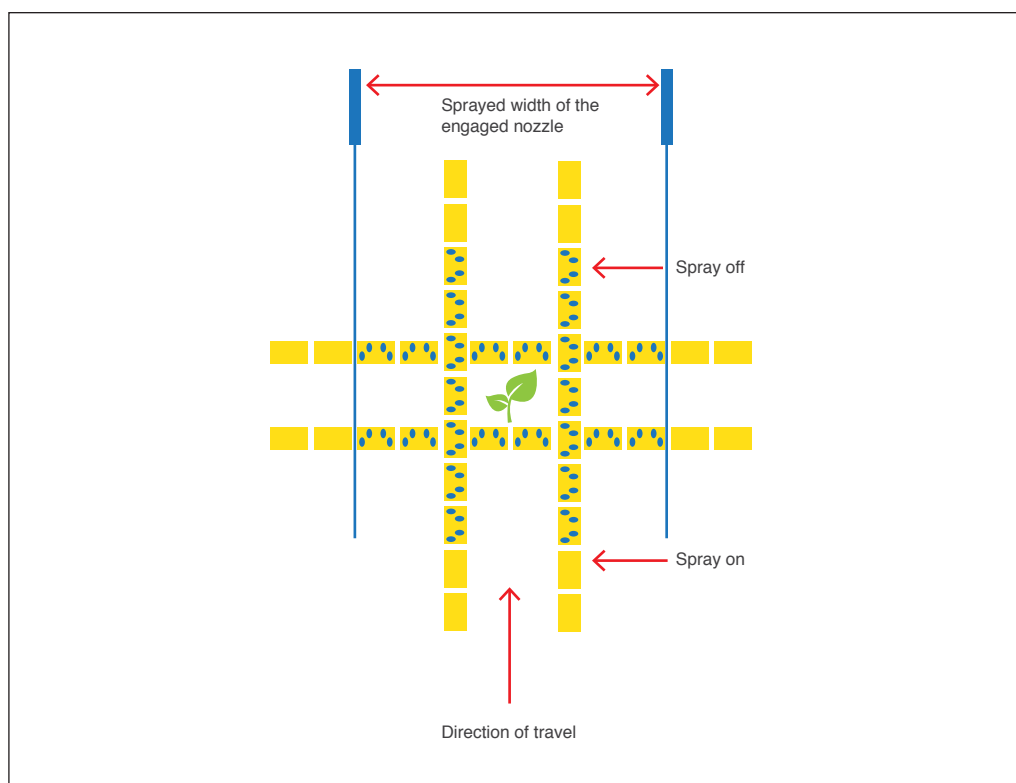


As a guide, for fully translocated herbicides the minimum area covered should be between and 6 and 8 per cent. At 60L/ha and a duty cycle of 60 per cent, the area covered regularly drops below this, whereas at 80L/ha and a duty cycle of close to 100 per cent, the area covered rarely drops below 6 per cent of the WSP card covered.

### 5.3.5 Identifying suitable spraying speeds and sprayed widths for target-selectable sprayers

There are two simple checks the operator can do to evaluate the set-up of a target-selectable sprayer: one is to look at the timing of sprays turning 'on' and 'off' in relation to the target and spraying speed; the other is to look at the sprayed width at various travel speeds and operating pressures.

**Figure 7** Water-sensitive paper placement for assessing target-selectable sprayers.



Placing cards on strips of timber aligned with the direction of travel can quickly illustrate when the individual sprays turn on and off in relation to the position of a weed for target-selectable sprayers.

Using the same type of timber strips, with WSP cards aligned perpendicular to the direction of travel (parallel to the boom) and the centre of the strip aligned with the weed, can show the actual sprayed width when the machine is operating at its usual spraying speed.

A number of product labels include a spot spray rate (rate of product per 100L of water) that may be used when application is made through a target-selectable sprayer. Where a spot spray rate is not included on the label, the applicator must apply the product at the litres-per-hectare rate, which requires the rate to be calculated based on the sprayed width of each nozzle (as single nozzle may fire and no overlap of the patterns can occur).



To calculate the applied rate based on the sprayed width:

**Litres per hectare = litres per minute per nozzle x 600 ÷ sprayed width  
per nozzle (in metres) ÷ speed (km/h)**



► For more information go to **Module 20: Target-selectable sprayers**, or **Module 8: Calibration of the spray system**

#### Placement of water-sensitive paper to test the sprayed width for a WeedSeeker®



Often when testing the spray coverage of target-selectable sprayers it is useful to ensure the area for the trial is free of any green vegetation that might trigger the cameras, and to deliberately transplant weeds into the test area.

When the spraying speed is not appropriate for the nozzle type or timing, the spray droplets will deposit onto the WSP cards well before or well after the position of the weed.

#### Spray coverage obtained when the wrong nozzle is fitted to a target-selectable sprayer



The sprayed width may differ in the field compared to stationary tests. ►

Source: Bill Gordon

The sprayer has pre-orifice nozzles fitted, delaying when the droplets arrive at the target. The sprayer travelled from the bottom of the image to the top. ►

Source: Bill Gordon

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## 6. Summary

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There are many variables that can impact on the outcome of a spray job, so it is important for spray applicators to use tools available to them to take some of the guesswork out of the spraying operation, especially the nozzles chosen and the total application volume used.

The choice of application volume and spray quality are the two main factors that will affect the outcome of the application and generally drive the decision about how the sprayer is set up. However, once the spray rig is in the paddock most operators can only 'hope' that the set-up will get enough of the spray droplets to land where they are required. Unless the operator is actually assessing and measuring the impact of the set-up and how he/she operates the sprayer on the spray coverage, it really is guesswork.



[NEXT MODULE](#)

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**SPRAY APPLICATION MANUAL FOR GRAIN GROWERS**

**Module 22** Integration of the sprayer with other farm equipment

Tyre centres, equipment widths and spacings

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