Australian Government

Australian Pesticides and Veterinary Medicines Authority

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Spray Drift Data Guideline

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CONTENTS

PREFACE

This guideline describes how information and data related to spray drift management (spray drift data) may be generated and submitted. Spray drift data are generated in accordance with international standards (as listed throughout this guideline) and their use is explained in the Spray drift risk assessment manual (SDRAM) which also includes a glossary of terms and abbreviations.

In this guideline, spray drift data relate only to exposure (ie deposition curves as described in Section 4 of the SDRAM), not to the hazard that is posed by specific agricultural chemicals (ie Regulatory Acceptable Levels as described in Section 3 of the SDRAM).

Spray drift data may be submitted for four purposes:

- applying for the registration (or variation) of an agricultural chemical product or product label
- applying for a permit
- inclusion of custom deposition curves in the Spray Drift Management Tool (SDMT) outlined in Section 4 and Section 7 of the SDRAM
- providing information for a Chemical Review

If spray drift data are not submitted, standard deposition curves (see Section 4 of the SDRAM) will be relied upon, provided that they are relevant to the use pattern being considered. If no relevant deposition curve is available (because the type of application equipment or practice is relatively uncommon or unique eg ultra-low volume applications by aircraft), the submission of spray drift data is important to ensure that risks are correctly characterised and appropriate mitigation measures are implemented.

General information about how the product is to be used is an essential component of submitted spray drift data. This may include specific instructions on the proposed label related to application methods, etc. Valid scientific argument related to spray drift management may also be submitted.

1 GENERAL INFORMATION

Generally, spray drift data may be submitted from field trials or wind tunnel studies for any application equipment type. However, both have limitations:

- Field trials can be undertaken for any application equipment or practice, but results are inherently variable so require many replicates to produce reliable results. Results are also limited in their ability to be extrapolated to account for different settings/conditions that were not examined at the time of the trial.
- Wind tunnel studies are generally more efficient to conduct than field trials, but their results require validated modelling tools specific for each type of equipment (ie boom sprayers, vertical sprayers and aircraft as described in the SDRAM glossary) to generate a predicted downwind deposition curve. There is no validated tool available for measurements other than those on droplet size or for vertical sprayers. Furthermore, the spray drift management performance of some technologies cannot be measured in a wind tunnel.

Combinations of field trials and wind tunnel studies may be useful. For example, if a certain nozzle is used to demonstrate the performance of a drift reduction adjuvant (refer to Section 4 of this guideline) in a field trial, additional nozzles could then be compared in a wind tunnel study; any nozzles that produce a droplet size distribution (DSD) as coarse, or coarser, than the nozzle used in the field trial would be expected to produce a similar reduction in downwind deposition as good or better than seen in the trial.

Some international standards mentioned in this guideline also include information about the use of data as well the generation of data. The APVMA does not rely on those elements of these standards regarding the use of data because of the inconsistency between standards and/or the lack of alignment with contemporary spray drift risk assessment protocols (refer to the SDRAM for how data will be used).

Applicants are reminded that, under section 160A and 161 of the AgVet Code (Reporting new information), they are required to notify the APVMA if they become aware of information which may affect a registration decision. This would apply to a spray drift risk assessment if the applicant becomes aware of any information which indicate that an increased risk of spray drift (compared to the relevant APVMA standard deposition curves or previously submitted spray drift data) is likely, due to the inherent properties of the formulation and/or the use of specific application equipment or practices. For example, data would be required if it were found that the formulation of a product caused the droplet size classification to become finer than classified by the nozzle’s manufacturer.

2 CONDUCTING FIELD TRIALS

The basis for all field trials is provided in the following standard:

- International Organization for Standardization—ISO 22866: Equipment for crop protection—Methods for field measurement of spray drift

Further information can be found in the following standards or guideline documents issued by government agencies or non-government organisations:

- American Society of Agricultural and Biological Engineers (ASABE)—ASAE S561: Procedure for Measuring Drift Deposits from Ground, Orchard, and Aerial Sprayers
- International Organization for Standardization—ISO 22369-2: Crop protection equipment—Drift classification of spraying equipment—Part 2: Classification of field crop sprayers by field measurements
- Julius Kühn Institute (JKI), Germany—Guideline for the testing of plant protection equipment 2–2.1 Procedure for the registration of plant protection equipment in the section "drift-reduction" of the register of loss reducing equipment of the descriptive list
- Julius Kühn Institute (JKI), Germany—Guideline for the testing of plant protection equipment 7–1.5: Measuring direct drift when applying liquid plant protection products outdoors (note that the JKI website is in the process of being updated to include English translations, in the interim please email spraydrift@apvma.gov.au to obtain a translated copy).
- United States Environmental Protection Agency (US EPA)—Generic Verification Protocol for Testing Pesticide Application Spray Drift Reduction Technologies for Row and Field Crops

For the purposes of quality control and consistency across different testing equipment, all field trials should include data generated from a reference sprayer under the same, or very similar, conditions as the technology or practice being assessed for its potential to reduce drift. Specific reference sprayers are not defined, in order to provide flexibility and recognise historical trials and differences between standards and guidelines. As a general rule the following may be considered:

- Boom sprayers and aircraft—A standard boom set up and used in accordance with the principles of good agricultural practice to produce a MEDIUM size droplet as classified by the relevant nozzle manufacturer specifications that refer to a recognised droplet size classification standard or guideline (refer to the SDRAM glossary).
- Vertical sprayers—A standard axial-flow airblast sprayer (without deflectors or other modifiers) calibrated, set up and used in accordance with the principles of good agricultural practice for spraying the target tree/vine crop (ie nozzles are not directed above the canopy and the outside section is shut off when spraying the last row or turning at the end of rows, etc.)

Submissions without accompanying reference sprayer data will be considered valid scientific argument is provided to demonstrate the quality of the trial. For example, the testing facility or organisation that generated the data, or the equipment itself, may be accredited under an international government scheme for the purposes of conducting testing of pesticide spraying equipment. The use of proposed testing facilities and accreditation schemes should be discussed with the APVMA prior to submission of an application.

3 CONDUCTING WIND TUNNEL STUDIES

The basis of all wind tunnel studies is provided in the following standard:

- International Organization for Standardization—ISO 22856: Equipment for crop protection—Methods for the laboratory measurement of spray drift—Wind tunnels

Further information can be found in the following standards or guideline documents issued by government agencies or non-government organisations:

- ASTM International- ASTM E799, Standard Practice for Determining Data Criteria and Processing for Liquid Drop Size Analysis
- ASTM International - ASTM E1260, Standard Test Method for Determining Liquid Drop Size Characteristics in a Spray Using Optical Nonimaging Light-Scattering Instruments
- ASTM International—ASTM E2798, Standard Test Method for Characterization of Performance of Pesticide Spray Drift Reduction Adjuvants for Ground Application
- ASTM International—ASTM E2872, Standard Guide for Determining Cross-Section Averaged Characteristics of a Spray Using Laser-Diffraction Instruments in a Wind Tunnel Apparatus.
- US EPA—Generic Verification Protocol for Testing Pesticide Application Spray Drift Reduction Technologies for Row and Field Crops

For the purposes of quality control and consistency across different testing facilities, all wind tunnel studies should include data generated from reference nozzles. These reference nozzles are described in the following standards; data for them may either be submitted as a complete set or from the two reference nozzles (one reference nozzle with a smaller, and one with a larger, Dv0.1 measurement value compared to the technology or practice being tested):

- Low speed wind tunnels (for boom spraying)
  - ASABE—ANSI/ASAE S572: Spray Nozzle Classification by Droplet Spectra
  - British Crop Production Council (BCPC)—Southcombe, E.S.E. et al. (1997). The International (BCPC) Spray Classification System Including a Drift Potential Factor. Proc. BCPC Conf.—Weeds, pp. 371-380
- High-speed wind tunnels (for aerial spraying)
  - ASABE X641 (currently under development)

Note: The APVMA is currently participating in a working group to establish an ASABE standard for the classification nozzles used on an 'aircraft' (currently designated ASABE X641 as listed above). This guideline will be updated as soon as the new standard it is issued. In the interim, the general principles of the modified ANSI/ASAE S572 standard described in the following research may be relied upon for nozzles used on an 'aircraft' (noting that this standard will no longer be referred to in this guideline once the ASABE standard is recognised):

- Hewitt, A.J. (2008). Droplet size spectra classification categories in aerial application scenarios. Crop Protection, 27, pp. 1284–1288

4 TESTING FORMULATIONS OR ADJUVANTS

The influence that a formulation or adjuvant can have on spray droplet formation, and therefore spray drift potential, is well known. The formulation or adjuvant effect can vary greatly between different styles of nozzles. To recognise this for ground boom applications, spray drift data should be generated with either:

- The specific nozzle or nozzle/s and pressure ranges intended for use (which would then form specific label instructions or SDMT conditions that limit use only to what was tested)
- The set of nozzles listed in Table 1 for the droplet size relevant to the application (which would then allow label instructions or SDMT conditions to apply to any nozzle/pressure which can achieve that droplet size classification)

Due to the relatively small range of nozzles available, for aircraft and vertical sprayer equipment spray drift data should be generated only with the specific nozzle or nozzle/s and pressure ranges intended for use.

4.1 Tank mixes

If a tank mix is to be a specific instruction in the 'Directions for Use' table of the label then wind tunnel studies should be reflective of this tank mix ie if the label directions for use require another product to be included in a tank mix then both products should be included in the test solution.

If a tank mix is not a specific label instruction but is allowed under applicable state or territory legislation, there is no need to include tank mix partners in wind tunnel testing. This is reflected in the current APVMA agricultural labelling code in section '16. Compatibility statements' and is a matter for industry stewardship programs to address. However, in accordance with Reporting new information requirements, if a tank mix is known to increase spray drift risk, applicants or registrants are required to notify the APVMA and include incompatibility statements on product labels.

Table 1: Reference nozzles for ground boom application by droplet size classification and system pressure (refer to ANSI/ASAE S572 for droplet size classification codes and colours)

Nozzle Type	Exit orifice Type	Nozzle	System Pressure (bar)					
			F	M	C	VC	XC	UC
Air induction	Single	Hypro ULD120-04				6.0	4.5	2.5
		Hardi ISO Minidrift 025		6.0	4.0	2.0		
		TeeJet AIC11025				6.5	4.5	2.5
		TeeJet AIXR11002		6.0	5.0	2.5	1.5	
	Twin	TeeJet AI3070-02			4.0	2.0	1.5	
		Hardi ISO Minidrift Duo 025		6.0	4.0	2.0		
Air induction - Anvil	Single	TeeJet TTI110015					7.0	3.5
	Twin	TeeJet AITTJ60-11003			7.0	4.0	2.5	1.5
Anvil	Single	TeeJet TT11001	6.0	2.5				
		TeeJet TT11004			4.5	1.5		
	Twin	TeeJet TTJ60-110025		6.0	4.5	1.5		
Flat fan	Single	Hardi ISO F-110 015	5.0	1.5				
		TeeJet TP11001	3.5					
		TeeJet XR8003	4.0	1.5				
	Twin	TeeJet TJ60-6503	4.0	2.0				
Hollow cone	Single	TeeJet TX-18	5.0					
Pre-orifice flat fan	Single	Hardi ISO LD-110 025		5.0	2.0			
	Twin	TeeJet DGTJ60-11002	4.0	2.5				