



Better Training for Safer Food *Initiative*

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BTSF



European
Commission

Environmental aspects and sustainable use of PPPs: Drift

Consumers, Health and Food Executive Agency (CHAFEA)

Content

- Sources and routes of exposure for aquatic and terrestrial non-target organisms
- Application techniques and operational settings
- Risks to non-target plants, beneficial insects, wildlife, biodiversity and the environment in general;
- Risk mitigation measures such as buffer zones for water protection, specific spraying techniques (e.g. low-volume spraying, low-drift nozzles, dust reducing sowing equipment), etc;
- Drift reduction strategy



Exposure of non-target organisms

- **Terrestrial organisms**
 - Birds, mammals, arthropods, earthworms
 - Field boundary (direct effect)
 - Plants in field boundaries (to maintain biodiversity and support other organisms)
- **Aquatic organisms**
 - Watercourses at or near the field boundary
 - Streams, rivers, ponds, including dry watercourses
- **Bystanders and Residents**
 - Drift during application
 - Volatilisation and drift after application
 - Deposits of drift in garden etc.





Sources of exposure to PPPs - overview

- **Product type**
 - Applied as liquid with water carrier
 - Low volume or ultra low volume formulation (no addition of carrier)
 - Granular formulation
 - Seed dressing
- **Application techniques**
 - Hydraulic boom sprayer (arable)
 - Broadcast air assisted (orchard/vineyard)
 - Hand held application
- **Crop type**
 - Dictates the application technique
- **Aspect of the field**
 - Slope, field boundaries, water courses etc.

Drift with use of PPPs (1)

- **Drift of PPPs occurs during application of PPPs or during drilling of seed treated with a PPP**
- **Common scenario for EU MS involves the use of boom sprayers for the application of PPPs in liquid form**
 - Boom application also with application of granules
- **Application in downward direction towards the target**
 - Boom width generally 12-24m, but can be >36m
- **Release height (boom height) key factor**
- **Forward speed of equipment (can be >16 km/h)**
 - Wind shear effects, boom stability, boom height etc.

Drift with use of PPPs (2)

- **Use of broadcast air assisted sprayers for tree and bush crops**
 - Vertical boom sprayers less common
- **Release of spray in horizontal and upward direction**
- **Velocity of air assistance affects distance travelled by spray droplets**
 - Sedimentation time
- **Forward speed of equipment is restricted due to crop terrain and crop types (rarely >8 km/h)**

Key factors affecting drift (PPP not retained within field boundaries)

- **Droplet size**
 - Nozzle size and type
 - Spray pressure
 - Wind (air) shear
- **Droplet velocity**
- **Release direction**
- **Environmental conditions**
 - Wind speed, relative humidity, temperature
- **Formulation type**
- **Field boundary type**

Do you read the label?



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tratamentos conforme indicações
Macieira: Hiononete 100-150 ml/hl;
tigre: 120-150 ml/hl; hiononete
S. José, psilas: 150-200 ml/hl;
ml/hl; hiononete: 200 ml/hl;
pragas. No caso da mosca do
do fruto. Pereira: Hiononete
tigre: 120-150 ml/hl; hiononete
S. José, psilas: 150-200 ml/hl;
ml/hl; hiononete: 200 ml/hl;
gas. No caso da mosca do
do fruto. Videira: Cotonilha
150 ml/hl; algodão: 200-250 ml/hl
da praga, repetindo sempre
Pessegueiro: Afideos: 100-150 ml/hl;
120-150 ml/hl; cochonilha: 100-150 ml/hl;
ou 600 (iscos) ml/hl; tratar caso
caso da mosca do mediterrâneo
Ameixeira: Afideos: 100-150 ml/hl;
(iscos) ml/hl. Tratar para a praga
mosca do mediterrâneo; tratar caso
Cerejeira: Afideos: 100-150 ml/hl;
que apareçam as respectivas pragas
primeiro tratamento para a praga
necessário. Citrinos: Cotonilha
200 ou 600 (iscos) ml/hl; tratar caso
100-200 ml/hl; tratar caso da
da mosca do mediterrâneo; tratar caso
Oliveira: Traca: 150 ml/hl; tratar caso
Figueira: Cochonilha: 100-150 ml/hl;
600 (iscos) ml/hl; tratar caso da
da mosca do mediterrâneo; tratar caso
Tomateiro: Afideos: 100-150 ml/hl;
mento da praga. Morango: Afideos:
da praga. Melão: Afideos: 100-150 ml/hl;
Abóbora: Afideos: 100-150 ml/hl;
Afideos: 100-200 ml/hl; tratar caso
pragas. Ervilheira: Afideos: 100-150 ml/hl;

Can you read
the label?

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MALATHION (ΜΑΛΑΘΕΙΟ) 50%

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Malathion (Μαλαθείον)	50% β/ο
Βοηθητικές ουσίες	50% β/β
Διαλύτης: Ξυλόλιο	

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ΠΟΡΤΟΚΑΛΙΑ, ΕΛΛΑΔΑ
α) στα πλαίσια της
σταί επανέλαση
- Οκτώβριος 1995
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Ρόδοις. Παρακαλούμε
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από την 18/8/1995
καταρκτική συνέχιση
ση των πελατών
ΣΥΝΑΛΛΑΓΗ
της παρούσης με
ΕΛΛΑΔΑ, Ρόδοις
Παρακαλούμε
ση 18/8/1995
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ΠΑΤΑΤΕΣ, ΑΡΓΙ
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καμφάν γινεται
ΚΑΤΙΝΟΣ, ΑΡΓΙ
Για Αποστολή
προσφορά σε
Οι φασόλοι
με την εμφάνιση
σε: ΑΛΕΞΑΝΔΡΑ
ΚΑΛΟΔΕΣΙΑ
της πρώτης

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Drift mitigation (1)

- **Drift reduction technology (DRT)**
 - Drift reducing nozzles
 - Reduce the proportion of droplets in the driftable fraction, i.e. $< 100\mu\text{m}$
 - e.g. Air Inclusion (AI) nozzles
 - Nozzle size and type
 - Spray pressure
 - Wind (air) shear
 - Downward air assistance
 - e.g. Hardi Twin
 - Nozzle shields
 - Tunnel sprayers
 - Precision agriculture (LIDAR etc.)

Drift mitigation (2)

- **Application and operational conditions**
 - Select appropriate application technique
 - Settings of sprayer appropriate for the crop height, density of foliage, spaces between trees
 - Use of DRT when possible
 - Use of controlled droplet application (CDA) techniques
 - e.g. spinning discs to apply herbicide with ultra low volume (ULV) technique
 - Avoid unfavourable environmental conditions
 - Operational settings – low forward speed, low boom height, low pressure

Drift mitigation (3)

- **Use of buffer zones**

- Label requirements for minimum unsprayed buffer zone (UBZ) size to protect water courses
 - No UBZ requirements yet for terrestrial compartment
- Some MS have mechanism to reduce the UBZ size if approved DRT is used, e.g. LERAP in the UK
- UBZ with crop cover will reduce drift more than bare soil
- Riparian vegetation (growing adjacent to water courses) reduces drift
- Wind breaks commonly used around tree crops to reduce drift
- Select crops adjacent to water courses where DRT can be used for application of PPPs

Drift reduction strategy

- **Crop selection in sensitive areas**
- **Use lowest recommended dose rate if possible**
- **Application technique with minimum drift**
- **Drift reducing technology**
- **Operator awareness**
 - Environmental conditions e.g. wind
 - Time of day e.g. when beneficial insects not active
- **Encourage growth of vegetation around field boundaries**
- **Use Unsprayed buffer zones and uncropped strips around fields.**

Drivers for change/compliance

- **Economic sustainability**
 - (e.g. CAP payments)
- **Selling produce to supermarkets etc.**
- **Farm assurance/certification (e.g. GlobalGap)**
- **Continuous Professional Development (CPD)**

Case Study 2

BTSF

Understanding drift

- **Why does drift occur**
- **How can it be reduced**
- **Why should it be reduced**
- **Negative effects of drift**
- **What should be protected from drift**
- **How to set up a drift reduction strategy**



2011/07/06







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- ▣ 600 LTR HERBICIDE SPRAYER
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Tunnel sprayer









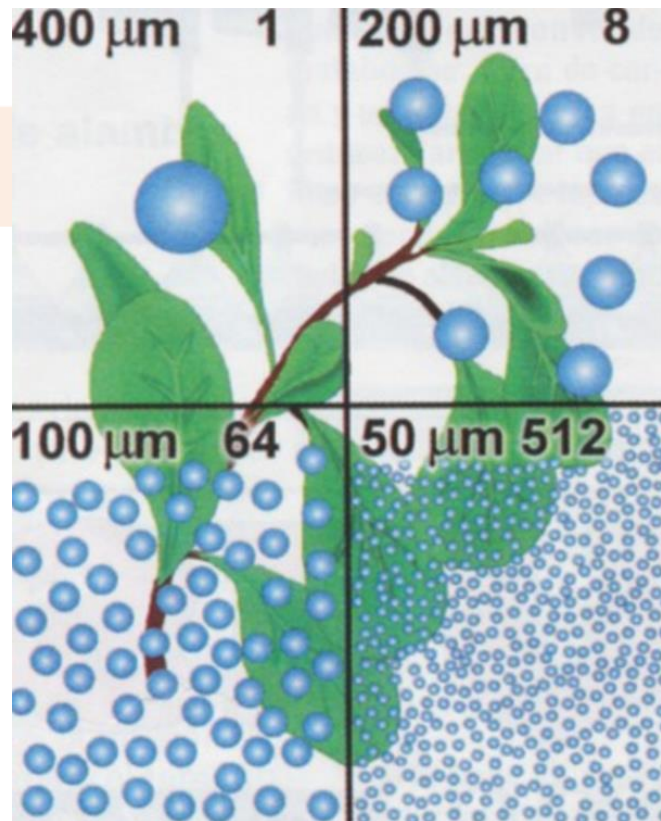
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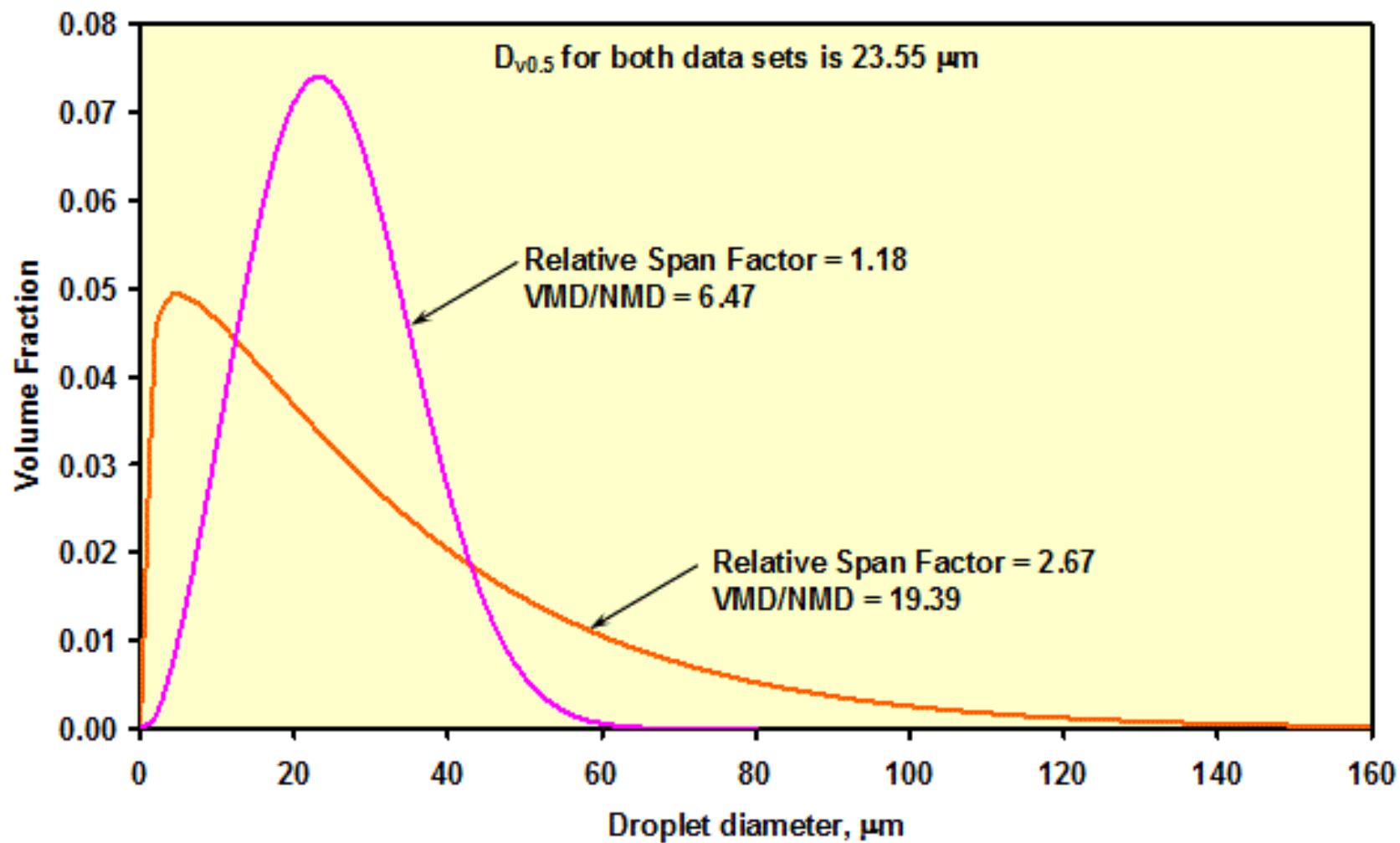


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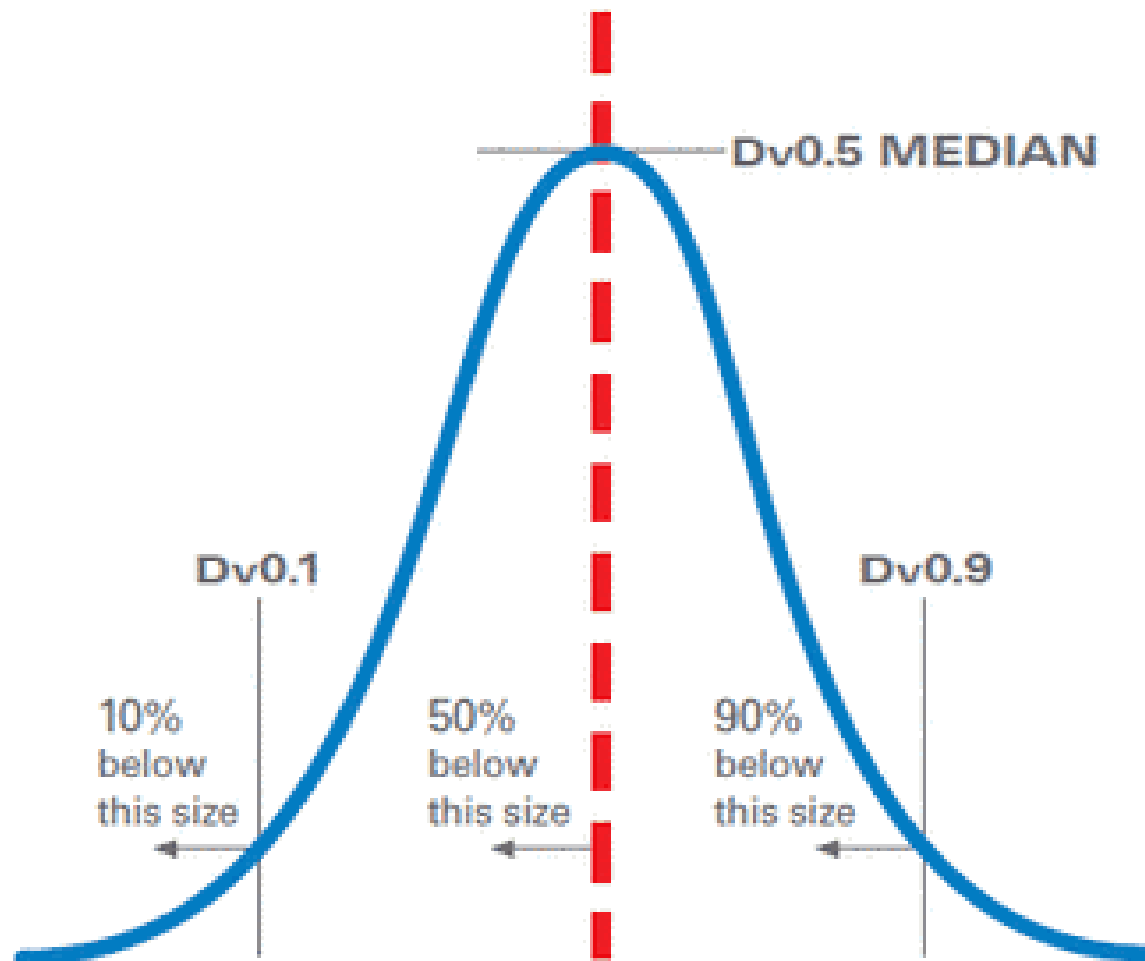
Effect of drop size. Balancing drift risk and efficacy







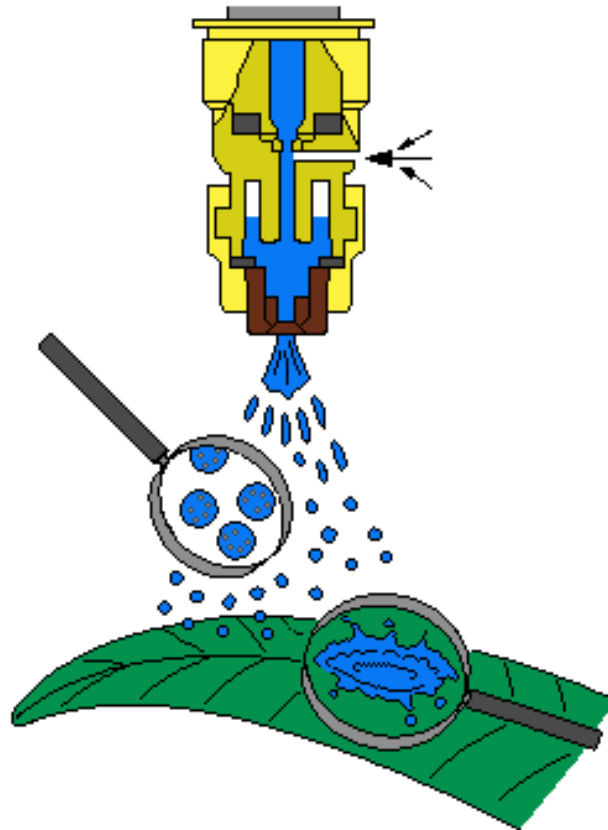
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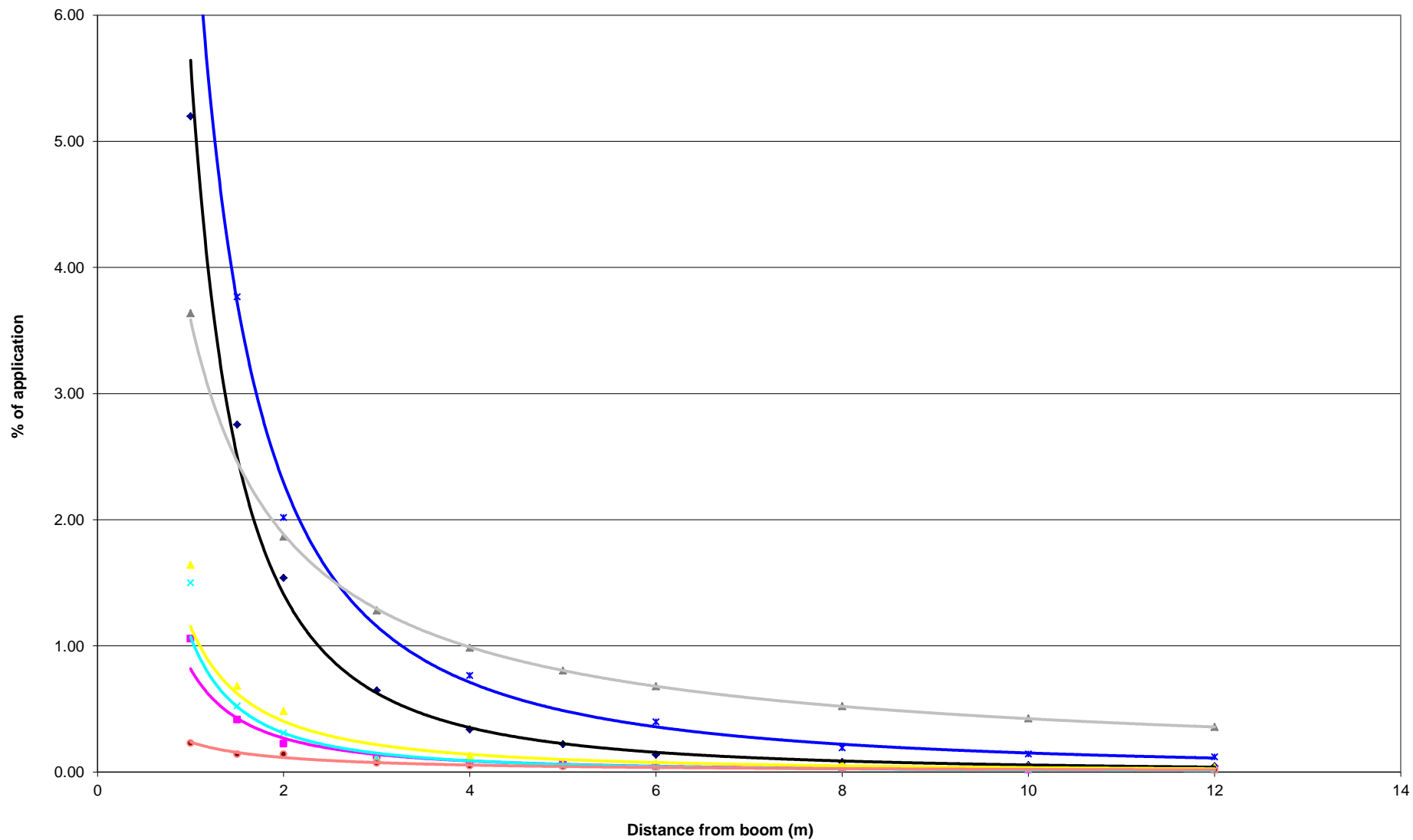
Low Drift Nozzles



How a Venturi nozzle (AI) works



Examples of drift decay curves





TeeJet® Broadcast Nozzle Selection Guide

	SOIL APPLIED	HERBICIDES		FUNGICIDES	
		POST-EMERGENCE		CONTACT	SYSTEMIC
		CONTACT	SYSTEMIC		
 Turbo TeeJet® Reference page 9		VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD
 Turbo TeeJet® at pressures below 30 PSI (2.0 bar) Reference page 9	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT
 Turbo TwinJet® Reference page 10	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
 Turbo TwinJet® at pressures below 30 PSI (2.0 bar) Reference page 10	VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT
 Turbo TeeJet Induction® Reference page 11	EXCELLENT		EXCELLENT		EXCELLENT
 XR, XRC TeeJet® Reference pages 12–13		EXCELLENT	GOOD	EXCELLENT	GOOD
 XR, XRC TeeJet® at pressures below 30 PSI (2.0 bar) Reference pages 12–13	GOOD	GOOD	VERY GOOD	GOOD	VERY GOOD
 AI XR TeeJet® Reference page 14	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT
 AI, AIC TeeJet® Reference pages 15–16	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT
 TwinJet® Reference page 17		EXCELLENT		EXCELLENT	
 DG TwinJet® Reference page 18	VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT
 Turbo TeeJet Duo® Reference page 19		EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
 Turbo TeeJet Duo® at lower pressures Reference page 19	VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT
 Turbo FloodJet® Reference page 23	EXCELLENT		VERY GOOD		VERY GOOD
 TurfJet® Reference page 24	EXCELLENT		EXCELLENT		EXCELLENT



Nozzle selection

for conventional boom sprayers treating cereals and oilseed rape



Agriculture & Horticulture
DEVELOPMENT BOARD

Nozzle type	Air induction			Conventional			Low drift (pre-orifice)		
	Flat fan			Flat fan	Hollow cone		Flat fan	Deflector	
Likely spray quality	Small droplet	Large droplet		Fine	Medium	Coarse	Fine	Medium	Coarse
Soil-acting herbicides									
Pre- and early post-emergence	▲	▲*		▲		▲		▲	▲
Foliage-acting herbicides									
Grass weeds – 3 leaves or less			▲▲	▲*			▲	▲	
Grass weeds – more than 3 leaves	▲*		▲▲	▲▲					▲
Broad-leaved weeds – up to 2cm across			▲▲	▲▲*					
Broad-leaved weeds – 2–5cm across	▲*		▲	▲▲			▲		
Broad-leaved weeds – more than 5cm	▲▲*			▲▲					▲
Non-selective (eg glyphosate)	▲▲	▲*		▲▲		▲		▲	▲
Cereal plant growth regulators (PGR) and eyespot fungicides									
Up to GS32	▲*			▲▲			▲		▲
After GS32	▲▲*			▲▲					
Cereal fungicides									
Up to GS23	▲*		▲	▲▲			▲		▲
Up to GS24–49	▲▲	▲*	▲	▲▲			▲		▲
After GS50 (ear spray)	▲▲*			▲▲			▲		
Cereal insecticides									
Cereals: autumn spray	▲*		▲	▲			▲		
Cereals: ear spray			▲▲	▲*			▲	▲	
Oilseed rape fungicides									
Vegetative stage	▲*		▲	▲			▲		▲
From green bud	▲▲*		▲	▲▲			▲		▲
Oilseed rape insecticides									
Vegetative stage			▲	▲*			▲		
From green bud			▲▲	▲*			▲		

Spray deposits and efficacy

Timing	Application volume	
Application timing is critical for high levels of efficacy. Timeliness is	For a given dose, higher volumes tend to deposit less active ingredient	When choosing an application volume, important sources of information are:

Nozzle colour
Industry standards specify that nozzles are colour-coded by

Colour	Flow rate at 3.0 bar pressure, l/min	Common designation
Orange	0.4	'01'

Nozzles and droplet size

Different commercial designs of air induction (AI) nozzle produce different droplet sizes. Those giving a small droplet size will often give higher levels of efficacy, but can also produce more drift than those generating a large droplet size. Recommendations are therefore given on the main chart (left) for AI nozzles giving small or large droplets.

Nozzles producing small or large droplets can be identified from the bar charts (right). Average droplet sizes from different designs of AI nozzles are shown relative to the same size conventional (flat fan) nozzle.

All measurements were made under standard testing conditions with all nozzles operating at 3.0 bar pressure. In each bar chart small droplet designs appear at the lower end, whereas large droplet designs are in the upper part.



small droplet



large droplet



conventional

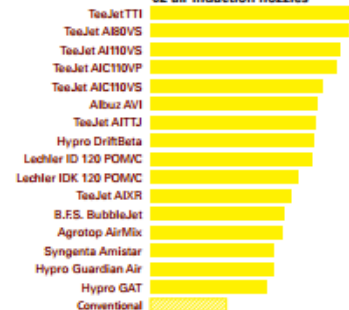
Spray drift

The risk of drift is mainly related to:

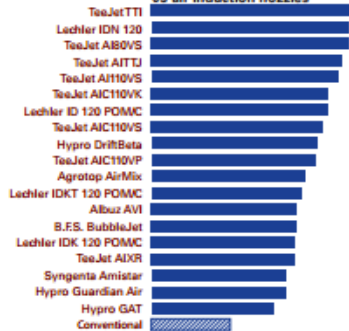
- Boom height – for 110° nozzles, the boom should be stable and 500mm or less from the top of the crop.
- Nozzle type, size and

Droplet size

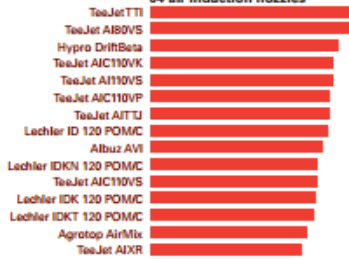
02 air induction nozzles



03 air induction nozzles



04 air induction nozzles



Case Study Exercise 1

**Below are some examples of multiple choice questions
Please discuss and select your answer**

Case Study Exercise 2

**What are the most important factors to consider in
reducing drift as part of a drift reduction strategy**

**List them in order of importance in the opinion of
your group**



This action/ training/ seminar is carried out by Eurofins Agrosience Services under the contract no. 2013 96 11 with the Consumers, Health and Food Executive Agency (former Executive Agency for Health and Consumers).

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Better Training for Safer Food BTSF

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