Prevent water contamination through point sources

Demonstrations

TOPPS

TOPPS is a 3-year, multi-stakeholder project covering 15 European countries – it stands for **T**raining the **O**perators to prevent **P**ollution from **P**oint **S**ources. TOPPS is funded under the European Commission's Life program and by ECPA, the European crop Protection Association.
TOPPS is aimed at identifying Best Management Practices and disseminating them through advice, training and demonstrations at a larger co-ordinated scale in Europe with the intention of reducing losses of plant protection products to water.

This brochure can be used as a guideline to organize demonstrations on good agricultural practices. For each process (transport; storage; before, during and after spraying; remnant management) some key aspects which can be demonstrated are discussed.

Partners

www.ecpa.be

www.pcfruit.be

www.harper-adams.ac.uk

www.landscentret.dk

www.insad.pl

www.imuz.edu.pl

www.deiafa.unito.it

www.esab.upc.es

www.cemagref.fr

www.arvalisinstitutduvegetal.fr

www.povlt.be

www.landwirtschaftskammer.de

Transport

This process and its required regulations are mainly discusses in the theoretical part of the training.

Practical part of the training:

- a transport box for PPP

(Source: DEIAFA)

(Source:HAUC)

(Source: Petr Harasta)

- Avoid any drip/leakage from the filled sprayer while travelling from the farm to the field

(Source:DEIAFA)

(Source: CMA)

Storage

Demonstration of well organized storage facilities:

- PPP should be stored in a lockable building or cupboard


(Source:DAAS)


(Source: Arvalis)


(Source: DEIAFA)

- Use a fire resistant storage room
- Use non-absorbent shelves


(Source: Arvalis)


(Source: UPC)

- Storage room should be bunded or equipped with a closed collection system. Barrier to prevent spills leacking out of the storage room or the use of plastic trays to store the PPP containers and packages.


(Source: Arvalis)


(Source: Syngenta)

- Always store powders above liquids
- Equipment to manage accidental PPP spillages: sand or wood-dust together with a floor brush, dustpan and plastic bags
- Do store empty packages in a secured, dedicated and covered facility


(Source: ISK)

(Source:UPC)

(Source: DEIAFA)


(Source: POVLT)

- Facilities for measuring PPPs (weight/volume)


(Source: DEIAFA)

- Instructions on hazards and emergency telephone numbers

(Source: DEIAFA)

(Source: DEIAFA)

(Source: UPC)

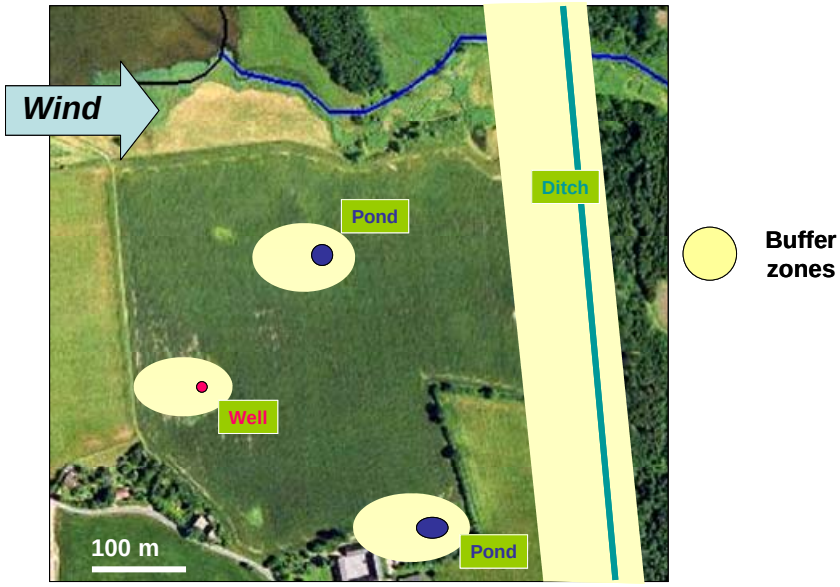

(Source: Arvalis)

- Protective clothing is stored separately in a locker, not in PPP storage room


(Source: Arvalis)

Before spraying

- Good planning of the spray activity is very important. Point out the importance of knowing the exact size of the fields and the location of the sensitive areas.



- Sprayer callibration


(Source: UPC)


(Source: DEIAFA)


(Source: Arvalis)


(Source: Hardi International)

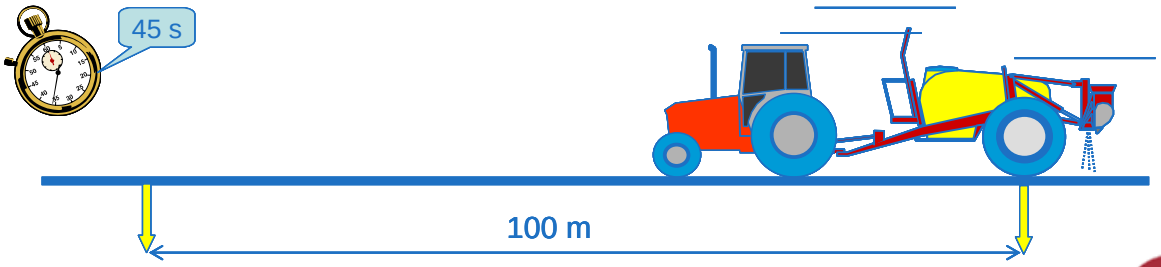
1 Speed check:

Use a half filled sprayer (with clean water) in the area you want to spray

$$\frac{\text{Distance (m) x 3.6}}{\text{Time (s)}} = \text{Speed (km/h)}$$

Example :

$$\frac{\text{100 (m) x 3.6}}{\text{45 (s)}} = \text{8 (km/h)}$$



2 Determining nozzle flow rate and spray pressure

Nozzle flow per nozzle :

$$\frac{\text{Distance between nozzles (m) x Volume/ha (l/ha) x speed (km/h)}}{\text{600}} = \text{nozzle flow (l/min)}$$

Example:

Volume to be applied 250 l/ha

$$\frac{\text{0.5 (m) x 250 (l/ha) x 8 (km/h)}}{\text{600}} = \text{1.67 (l/min)}$$

The brown nozzle suits our need:

1.63 l/min at 2bar

				6	7	8	10	12	15	20	25 km/h
SYNTAL-CT 371769 (12pcs. 755632) CERAMIC-CT 371776 (12pcs. 755639)							SYNTAL-S 371711 (12pcs. 755658) CERAMIC-S 371742 (12pcs. 755679)				
05-B-ovn	1.5	1.41	C	283	242	212	170	141	113	85	68
	2.0	1.63	C	327	280	245	196	163	131	98	78
	2.5	1.83	M	365	313	274	219	183	146	110	88
	3.0	2.00	M	400	343	300	240	200	160	120	96
	4.0	2.31	M	462	396	346	277	231	185	139	111
	5.0	2.58	M	516	443	387	310	258	207	155	124

A small pressure adjustmen is needed :

$$\left(\frac{\text{Wanted flow (l/min)}}{\text{Table flow (l/min)}}\right)^2 \text{ X Table pressure (bar) = Wanted pressure (bar)}$$

The brown nozzle will at 2,1 bar and 8 km/h apply 250 l/ha :

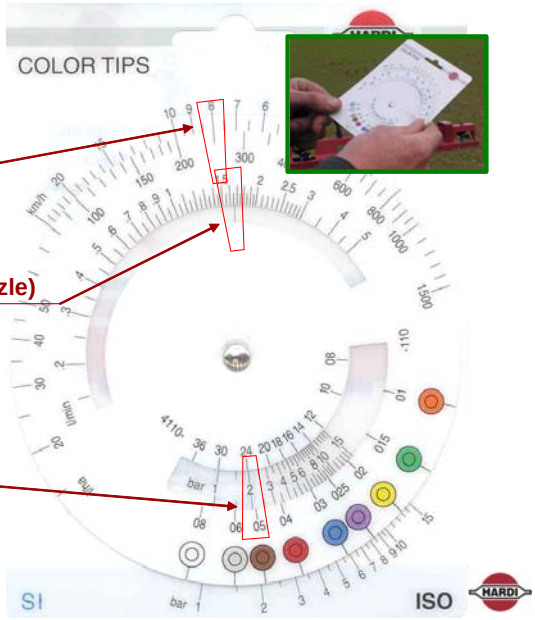
$$\left(\frac{\text{1.67 (l/min)}}{\text{1.63 (l/min)}}\right)^2 \text{ X 2 bar = 2.1 bar}$$

2 The easy way:

a Align checked speed and l/ha

b Read needed nozzle flow (l/min/nozzle)

c Choose a combination of nozzle and pressure



3 Checking nozzle flow

set pressure and measure 1 minute

Photo: Hardi International

- **If we find an average increase of more than 10% compared to new nozzles: change all nozzles.**
- **For sample of 2 nozzles per section: change all nozzles when increase in flow is 15%**

- Comparison between the “conventional” way of filling the sprayer (first dilution of the product in a bucket, then pouring of the concentrated solution in the main tank of the sprayer) and use of an induction hopper. Demonstrate the advantage of an induction hopper in limiting the risks of spillage.

Filling with bucket (Source: DEIAFA)

Filling with induction hopper (Source: DEIAFA)

- Demonstration on how an induction hopper works: how it can be connected to the farm water network (tap water). If the sprayer is not equipped with an induction hopper, a portable induction hopper can be used.

Induction hopper fixed to the sprayer
(Source: DAAS, Jens Tønnesen)

Portable induction hopper
(Source: UPC)

- Filling of the sprayer with water. Avoid filling directly from well or tap water. Point out the advantage of using an intermediary water tank or gallow sytem.

(Source: DAAS, Jens Tønnesen)

(Source: lwknrw)

- Take all the necessary precautions when filling the sprayer on the farmyard. Demonstrate the use of a plastic cover to collect spills during filling.

(Source: DEIAFA)

(Source:UPC)

- Demonstration of the use of a flowmeter to fill the tank with water avoiding overflow.

(Source: UPC)

(Source: UPC)

- Cleaning of empty PPP containers:
  - if present, use the cleaning nozzle in the induction hopper or sprayer tank
  - if cleaning manually, triple rinse empty PPP containers
  - collect the rinsing water from the empty containers and dispose it in a safe way. If possible add it to the spray mixture.

(Source: DAAS, Jens Tønnesen)

(Source: ISK)

(Source: DAAS)

- Demonstration of nozzles:
    1. Necessary equipment:
        - a clean sprayer with clean water in the tank
        - a collection of different types and sizes of nozzles
    2. Mount four/five nozzles of each type next to each other. Begin with the most coarse nozzle in the windward side
    3. Spray with different pressures (sprayer is kept stationary) and observe drift from the different nozzles
    4. Observe, if desired, the drop size distribution by passing a water sensitive paper through the spray cloud. If the result is not satisfactory when the sprayer is kept stationary, repeat the test with a sprayer in movement.

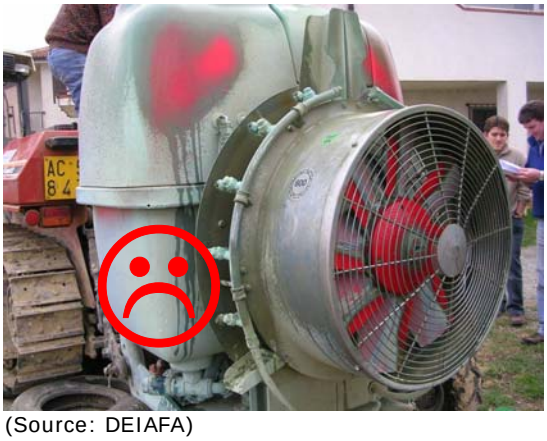
During spraying

- Explanation of general aspects such as air orientation, boom height adjustment, forward speed,...
- Demonstration of the importance of the correct functioning of antidrip devices on nozzles and of the correct orientation of spray jets in order to avoid dripping from sprayer parts


(Source: DEIAFA)


(Source: UPC)


(Source: DEIAFA)


(Source: DEIAFA)

- Recommendation to switching off nozzles during turns at the end of the rows

After spraying

- Internal cleaning of the sprayer.

Approach 1:

- Add a fluorescent marker to the spray tank
- Rinse according to the single and triple rinsing method
- Take samples from the rinsing solutions (single versus triple) and visually check the difference in colour






Approach 2:

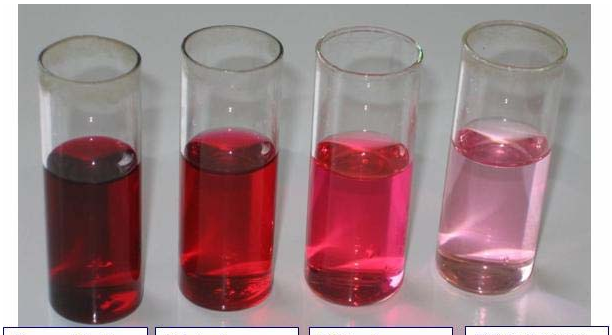
- A specially built model is used to demonstrate triple rinsing.
- As colouring agent vitamin B12 (riboflavin) is used (yellow colour).
- Clean water from the rinsing tank is added in 3 steps to the main tank. Thanks to the clear plastic sides of the tank you can see that the yellow colour becomes fainter after each diluting step.


(Source: POVLT/pcfruit)


(Source: POVLT/pcfruit)

Approach 3:

- Necessary equipment:
  - Clean sprayer with full rinsing tank
  - 50-100 litre clean water in the tank
  - Clean containers (different sizes)
  - Trace element (Amarant or Ponceau, which are red colouring agents)
  - Protective clothing, e.g. coverall and disposal gloves
  - 4 small clear glasses for sampling rinsing water from the cleaning process
- Pour two/three containers of water with trace element in the tank (5-10 litres in total)
- Rinse containers with water and fill rinsing water in the tank
- Mark the rinsing tank with two marks, dividing the water in three parts
- Spray until air comes out of the first nozzle – check the amount of residual in the tank. Take a sample in the first glass.
- Stop agitation and spray until air comes out of all nozzles – check the amount of residual in the tank again.
- Clean the tank with the first third of the rinsing water. Spray until air comes out of all nozzles. Take a sample when spraying out the diluted residual. Repeat the process to more times. Collect a sample after each dilution.
- This process can be carried out with sprayers with and without induction hopper.



Spray fluid in the main tank	Diluted spray fluid after the **first** internal wash	Diluted spray fluid after the **second** internal wash	Diluted spray fluid after the **third** internal wash

(Source: DAAS)

- External cleaning of the sprayer.

(Source: DEIAFA)

(Source: Arvalis)

(Source: lwknrw)

(Source: lwknrw)

- Sprayers with and without a clean water tank. The possiblity to equip the sprayer with an clean water tank if not present.

Clean water tank with a spray lance for external cleaning of the sprayer (Source: UPC)

(Source: DAAS, Jens Tønnesen)

Remnant management

- Demonstration of a good equiped filling and cleaning place with a collection tank for spills and cleaning water

(Source: DAAS)

(Source: Arvalis)

- Correct disposal of empty PPP containers and contaminated material
- Demonstration of purification systems: biobed, phytobac®, biofilter, Dehydration system, Physico-chemical clean up (Sentinel®)

Biofilter (Source:POVLT/pcfruit)

Biobac (Source: DEIAFA)

Biobac (Source: DEIAFA)

Biobed (Source: ISK)

Héliosec® Dehydration Equipement (Source: Syngenta)

Sentinel® (Source: pcfruit)