

## **Spray drift and resident risk in orchard spraying; reference and spray drift reducing techniques**

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### **Introduction**

In the Netherlands spray drift experiments for orchard spraying were carried out on a uniform basis comparing a reference spray technique and to be classified drift reducing techniques. Due to the large number of measurements a discrimination could be made based on the BBCH code for pome fruit development during the year distinguished between the periods full leaf (BBCH 74-92), the intermediate periods (BBCH 61-73 and 93-0) and the dormant (BBCH 0-60) period (Zande & Wenneker, 2013). As spray drift measurements were done both as ground deposition next to the orchard and as airborne drift at one distance from the last treated tree row of the orchard spray drift curves could be generated both for surface water and for bystander and residents risk analysis (Zande et al., 2010, 2014).

### **Materials and Methods**

Spray drift measurements were carried out according to the ISO standard (ISO 22866; 2005) adapted for the situation in the Netherlands (ground deposits, ditch, surface water next to the sprayed field) following the Dutch protocol (TCT, 2003). Apple trees were sprayed with a solution containing the fluorescent dye Brilliant Sulpho Flavine (BSF) and a non-ionic surfactant (Agral) to the spray agent. Spray drift deposition was measured using collectors (synthetic cloths of 0,05m<sup>2</sup>/0,1 m<sup>2</sup>) which were placed at several distances up to 25 m from the centre of the last tree row on ground surface on the downwind edge of the orchard. At 7.5 m distance from the last tree row, collectors (Siebauer Abtriftkollektoren) were fit to vertical lines up to 10 m height to collect airborne spray drift. The spray drift was measured by quantifying the BSF deposition on the collectors. The extrapolation of airborne spray drift at 7.5 m measuring distance to different distances is based on results of individual tree row sprayings (full leaf and dormant situation) with a cross-flow fan sprayer (Michielsen et al., 2007).

The reference technique for orchard spraying is a cross-flow fan sprayer (Munckhof), equipped with Albuz ATR lilac nozzles, which at 7 bar spray pressure produces a Very Fine spray quality (Southcombe et al., 1997). The experiments were carried out from early (dormant) to late growth stages (full leaf, leaf fall) of the trees. In the early growth stages (developing foliage), air assistance was supplied with low gear settings for the fan. In the fully developed foliage stage, experiments were carried out with high gear fan settings. In total 316 spray drift measurements of the reference sprayer were analysed with 144 measurements in the full leaf stage (BBCH 74-92), 140 measurements in the dormant stage (BBCH 0-60) and 32 measurements in the intermediate (BBCH 61-73, 93-0) period. Drift Reducing Techniques can be grouped in drift reduction classes of 50%, 75%, 90% and 95% drift reduction compared to the reference (ISO22369-1). Entries in the drift reducing classes in the Netherlands for orchard spraying (based on spray drift deposition at 4.5-5.5 m from the last tree row in the full leaf situation) are determined. The results are based on comparative field measurements and are grouped in the different drift reduction classes.

### **Results**

Measured spray drift deposition on ground surface and estimated airborne spray drift (% of sprayed volume per unit area at 0-2 m height) based on measured airborne spray drift at 7,5 m downwind of the orchard at of the reference spray technique and the Drift Reducing Techniques of the classes 50%, 75%, 90%, 95% for fruit orchard spraying are presented in respectively Figure 1 and Figure 2 at distance from the last tree row.

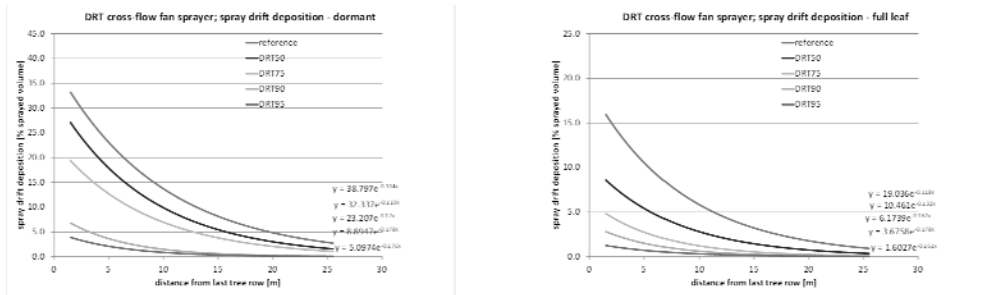


Figure 1. Measured ground deposition of spray drift (% of sprayed volume per unit area) downwind of the sprayed orchard in the dormant (BBCH 0-60; left) and full leaf situation (BBCH 74-92; right) at distance (m) from the last tree row for the reference cross-flow fan sprayer and Drift Reducing Technologies classes (DRT50, DRT75, DRT90, DRT95)

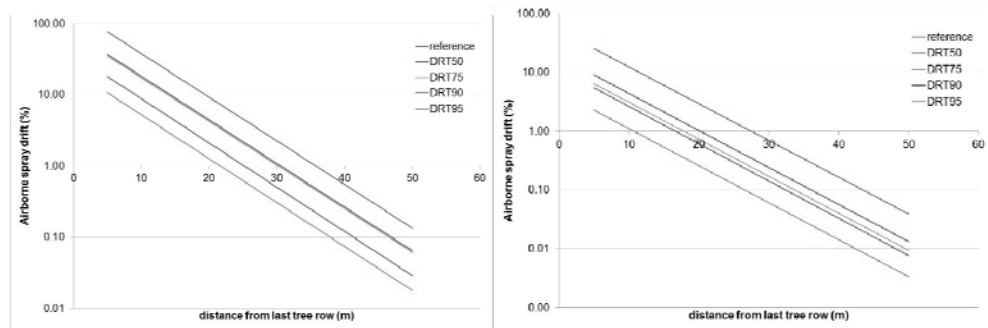


Figure 2. Estimated airborne spray drift (% of sprayed volume per unit area at 0-2 m height, log-scale) downwind of the sprayed orchard in the dormant (BBCH 0-60; left) and full leaf (BBCH 74-92; right) situation at distance (m) from the last tree row for the reference cross-flow fan sprayer and Drift Reducing Technologies classes (DRT50, DRT75, DRT90, DRT95) based on measured airborne spray drift at 7.5 m distance from last tree row

Results show that a 1% spray drift deposition at ground level occurs for the standard application technique at 35 m distance from the last tree row in the dormant situation and at 25 m in the full leaf situation of the trees. A 1% airborne spray drift level at 0-2 m height is estimated at 36m distance from the last tree row in the dormant situation and at 28 m in the full leaf situation of the trees. These distances can be reduced to resp. 10 m and 3 m for the ground deposition and 22 m and 11 m for the airborne spray drift using a DRT95 spray technique.

For the next years a research programme is set up for quantification of the residents risk from orchard spraying in the Netherlands. In this research the spray drift path way from the orchard to residents living around orchards will be quantified. Special attention will be paid to get further knowledge of especially the airborne spray drift over distance from the orchard boundary to the residents at different distances. Measurements will be done on spray drift (airborne and ground deposition), vapour drift during and directly after spraying and volatilisation from the crop after spraying.

### Acknowledgements

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