

Spray drift of a two-row tunnel orchard sprayer

Jan van de Zande, Jean-Marie Michielsen, Mostafa Snoussi, Hein Stallinga, Dirk de Hoog, Pieter van Daltsen, Marcel Wenneker

*Wageningen University and Research - Wageningen Plant Research, P.O. Box 16, 6700 AA Wageningen, The Netherlands
Email address: jan.vandezande@wur.nl*

INTRODUCTION

Earlier spray drift experiments showed that orchard tunnel sprayers equipped with standard nozzles achieved a spray drift reduction of 85% (Huijsmans et al., 1993). Spraying and blowing from both sides at the same time towards the tree canopy captures higher levels of spray in canopy and by shielding the spray process with a tunnel less spray can blow away. It is therefore expected that also the Lochmann two-row tunnel orchard sprayer may achieve high levels of spray drift reduction. To assess and underpin this expectation WUR performed spray drift field experiments spraying an apple orchard in the full leaf stage comparing the two-row tunnel sprayer equipped with 90% drift reducing nozzles (DRN90; Zande et al., 2008) against a reference cross-flow fan sprayer equipped with Very Fine spray quality nozzles.

MATERIALS AND METHODS

Spray drift experiments were setup to fulfil the requirements of and to provide proper data for the authorisation procedure of Plant Protection Products (Ctgb), the Environmental Decree (TCT protocol) in the Netherlands and international protocols on spray drift measurements and its classification (ISO22866, ISO22369). In the spray drift field experiments a comparison was made between the Lochmann two-row tunnel orchard sprayer (Van der Linden, Dreumel, Netherlands; Lochmann Plantatec, Nals Italy; tunnel -Lipco GmbH, Sasbach Germany) fitted with Albus TVI8001 venturi hollow cone nozzles (7 bar spray pressure, DRN90) and a standard cross-flow fan orchard sprayer; Munckhof with Albus ATR Lilac nozzles (7 bar spray pressure). Average tree height was 2.75 m. Highest operating nozzle was for both sprayers set at 2.5 m. Air setting of the reference sprayer was; high fan gear box at 540 rpm PTO, having an air outlet speed of 21 m/s. Air setting of the tangential fans of the tunnel sprayer was 1570 rpm producing on average an outlet air speed of 10 m/s.

During the spray drift experiments the downwind outside 24 m of an apple orchard (Elstar; tree row spacing 3.0 m; Proeftuin Randwijk, Netherlands) was sprayed at the full leaf stage (BBCH 90/92) using the fluorescent tracer Acid Yellow 250. Spray drift deposition was collected downwind on a mowed grass area up to 25 m distance from the last tree row. Filter collectors (Technofil TF-290) were used on ground surface of sizes 0.50x0.10 m in a continuous row from 3 m to 15 m and of 1.00x0.10 m at 1,5 m, 20 m and 25 m distance from the last tree row. Airborne spray drift was measured at 7.5 m distance from the last tree row on a pole at which two lines with collectors (Siral Abdriftkollektoren) were attached at 1 m spacing up to 10 m height. For ground deposition spray drift reduction was evaluated at 4.5-5.5 m from the last tree row, position of surface water in a standardised ditch in the authorisation procedure for fruit crops in the Netherlands (Zande et al., 2000).

RESULTS AND DISCUSSION

The spray drift experiments showed that spraying an apple orchard at the full leaf stage (BBCH 90/92) with a Lochmann two-row tunnel orchard sprayer fitted with 90% drift reducing nozzles (Albus TVI8001; 7 bar spray pressure, DRN90) spray drift was clearly lower than of the reference sprayer (Fig. 1). Spray drift reduction at 4.5-5.5 m distance from the last tree row was 99.4% in comparison with the reference spray application. Based on these results this combination was classified as a spray Drift Reducing Technique (DRT) in the 99% drift reduction class in the Netherlands.

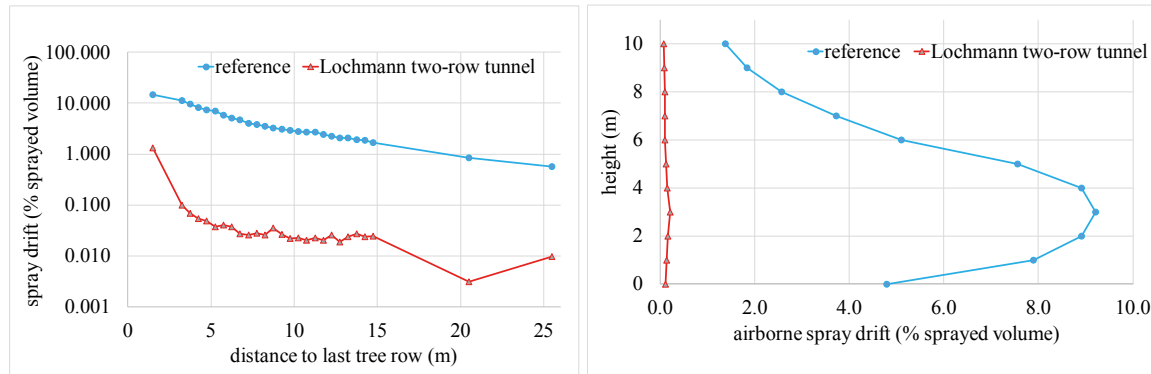


Fig. 1. Spray drift deposition (left) and airborne spray drift (right) at 7.5 m from last tree row (% sprayed volume) downwind of sprayed apple orchard in full-leaf situation (BBCH90-92) with a cross-flow fan sprayer (reference) and a Lochmann two-row tunnel sprayer equipped with 90% drift reducing nozzles.

Airborne spray drift at 7.5 m distance from the last tree row was for the Lochmann two-row tunnel orchard sprayer fitted with 90% drift reducing nozzles also much lower than of the reference spray system. Averaged over 10 m height airborne spray drift reduction of the Lochmann two-row tunnel orchard sprayer fitted with DRN90 nozzles was 97.8%.

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