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# Effect of Sprayer Speed on Spray Drift

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**Abstract:** As the need for timely applications of crop protection products is more pronounced but farm sizes are growing the needed capacity for spraying is apart from increasing working widths more often managed by speeding up sprayers. This can be done as boom sprayers are more and more having good suspension systems that allow higher speeds in the field with minimal sprayer boom movements. However little is known on what the effect of sprayer speed is on spray drift. In a series of experiments the effect of sprayer speeds of 6 and 12 km/h is evaluated. The experiments are performed with two nozzle types; a standard flat fan (XR11004) and a low drift pre-orifice flat fan nozzle (DG11004), both sprayed at 3 bar pressure. These combinations were sprayed both with and without air assistance (Hardi Twin Force). Spray drift was measured to the soil surface next to a sprayed potato field. Also airborne drift at 5m distance from the edge of the field was measured. Results show an increase in spray drift with increasing speed. The effect of the low drift nozzle could not compensate for the increase in spray drift because of the increase in sprayer speed. The drift reduction because of the use of nozzle type or air assistance decreased with increasing speeds. Drift reduction classification differs for different speeds.

**Keywords:** boom sprayer, nozzle-type, air assistance, driving speed, spray drift

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# Introduction

Legislation is introduced by the Dutch government for reduction of the emission of plant protection products to soil, (surface) water and air. The drift deposition, when spraying, contributes to the contamination of water surface. Therefore spray free and crop free buffer zones are introduced, to minimise the risk (Water Pollution Act, Plant Protection Act). Especially aquatic life is vulnerable to the toxic contents of plant protection products. Field measurements of spray drift from boom sprayers operating over arable crops have shown that drift increases with increase in wind speed, boom height, forward speed, and when a high proportion of the spray is produced in fine drops (<100 μm in diameter). The need to make timely applications of pesticide involves operating with high work rates. This often involves the use of wide booms, low-volume rates involving fine sprays. All of these trends increase the risk of spray drift [Zande et al. 2000]. Following trends abroad there is a growing interest to increase sprayer speed to enlarge spray capacity also in the Netherlands. A general reduction in spray drift deposition to water surface next to the sprayed field can be achieved by improvements in spray application techniques. It is discussed whether an increase in sprayer speed influences the drift reducing capacity of the used spray techniques.

Arvidsson [1997] found a positive correlation between driving speed and spray drift. When driving speed was increased with 1m/s spray drift deposition was increased with 1.0%, within the trajectory of 1 $m \cdot s^{-1}$ and 2.5 $m \cdot s^{-1}$ velocity. This means a spray drift deposition of respectively 4.2% and 5.8% on the zone 1–5 m next to the field. Miller and Smith [1997] found an increase in airborne spray drift of 51% when forward speed was increased from 4 to 8 $km \cdot h^{-1}$ and by 144% when the speed was further increased to 16 $km \cdot h^{-1}$. No data are available from field measurements on the effects on spray drift of driving speed of drift reducing spray techniques in the Netherlands. Therefore in field experiments spray drift was quantified. A comparison was made of two nozzle-types in combination with with and without the aid of air assistance on the field sprayer. This paper describes the results of the field experiments.

# Materials and Methods

## Drift measurements

Drift measurement were carried out according to the ISO-draft standard (ISOFDIS 22866;2004) adapted for the situation in the Netherlands (ground deposits, ditch, surface water next to the sprayed field) following the Dutch protocol [CIW 2003]. Drift was measured on ground surface on the downwind edge of an experimental field with a potato crop (cv Agria). Average canopy height of the potato crop was 0.5–0.7 m. The swath-width of potatoes sprayed was 24 m. The length of the sprayed track was at least 75 m. The distance of the last downwind nozzle to the edge of the field (the last crop leaves) was determined at approximately 0.7 m. During the growing season eleven repetitions of the measurements were done on more dates to obtain an average crop season (crop height) result.

Spray drift measurements were carried out adding the fluorescent dye Brilliant Sulfo Flavine (BSF; 3.0 g · $L^{-1}$) and a surfactant (Agral; 0.1%) added to the spray agent. Ground deposit was measured on horizontal collection surfaces placed at ground level in a double row downwind of the sprayed swath. The collectors were placed at distances 0–0.5, 1–1.5, 1.5–2, 2–2.5, 2.5–3, 3–3.5, 3.5–4, 4–4.5, 4.5–5, 5–5.5, 5.5–6, 7.5–8.5, 10–11, 15–16 m from the last downwind nozzle. Collectors used were synthetic cloths (Technofil TF-290) with dimensions of 0.50 × 0.10 m and 1.00 × 0.10 m.

Airborne spray drift was measured at a distance of 5.5 m from the last downwind nozzle of the field sprayer. The collection of airborne spray was done on two separate lines with attached collectors at 0, 1, 2, 3, 4, 5 and 6 m height. Collectors used were spherical synthetic cleaning pads (Siebauer nr.00140; diameter 0.08 m). The collectors were washed and the BSF concentration in the extracted fluid was measured by fluorimetry (Perkin Elmer LS45).

## Sprayer driving speed

During spraying the boom position in the field was measured with a system [Jong et al. 2000b] consisting of a laser distance indicator (Sick DME200) and an ultrasonic sound (AE, P42-A4N-2D-1C1-130) height sensor. The ultrasonic sensor was connected at the end of the sprayer boom, to measure boom height over the open strip. The data of the ultrasonic was directly sent (ADAM 4550) to the computer connected to the laser-measuring device. The system checked every 0.1 second the distance and height of the boom tip in the field. The height and the distance, together with the time were synchronised and recorded online.

## Used spray techniques

Specifications of the spray techniques used in the experiments are as summarised in Table 1. The sprayer applied 300 l · $ha^{-1}$ using Medium (TeeJet XR11004; Spraying Systems) or Coarse (TeeJet DG11004; Spraying Systems) spray quality [Southcombe et al. 1997] nozzle types at a driving speed of 6 km · $h^{-1}$ and 150 l · $ha^{-1}$ at a speed of 12 km · $h^{-1}$. The Coarse spray quality nozzle is a pre-orifice flat fan nozzle classified as a 50% drift-reducing nozzle [Porskamp et al. 1999] and used in combination with an end nozzle [Lechler IS8004] in the last nozzle holder to prevent overspray.

All nozzles were used in a conventional way and with the use of air assistance, with identical liquid pressure (3 bar). In case of air assistance (Hardi TwinForce), nozzles were kept vertical. Air velocity was set to the maximum capacity of the fan. The sprayer was a trailed one having a working width of 24 m. Boom height was set to 0.5 m above crop canopy.

## Reference spraying system

Measurements of spray drift were compared to a reference situation, a standard flat fan nozzle TeeJet XR11004 (Spraying Systems) used at 3 bar pressure. Sprayer boom height was set at 0.5 m above the top of the crop canopy. Driving speed was 6 km · h$^{-1}$ resulting in an applied volume rate of 300 l · ha$^{-1}$.

**Table 1.**
Settings of the field sprayer during spray drift field experiments

| | | | | |
|---|---|---|---|---|
| machine | Hardi TwinForce | | | |
| working width [m] | 24 | | | |
| nozzle spacing [m] | 0.50 | | | |
| nozzle type | XR 11004 | | DG11004 | |
| end nozzle | none | | IS8004 | |
| spray quality | Medium | | Coarse | |
| nozzle flow rate [l · min$^{-1}$] | 1.61 | | 1.68 | |
| spray pressure [bar] | 3 | | | |
| nozzle orientation | vertical | | | |
| air assistance | maximum at 240 bar | | | |
| air speed at outlet [m · s$^{-1}$] | 30 | | | |
| spray technique | Conventional | | High speed | |
| driving speed [km · h$^{-1}$] | 6 | | 11.7 | |
| spray volume [l · ha$^{-1}$] | (XR) 310 | (DG) 326 | (XR) 159 | (DG) 167 |

## Meteorological conditions

Meteorological conditions during the spray drift measurements were recorded. Wind speed and temperature were recorded at 5 s intervals at 0.5 and 2.0 m height, using cup anemometers and Pt100 sensors, respectively. Relative humidity was measured at 0.5 m height and wind direction at 2.0 m height. Average recorded meteorological circumstances during the measurements are summarised in Table 2. Of the 11 measurements 9 (7 for the DG11004 conventional) were within the wind direction range of 90$^{o}$ +/–30$^{o}$ to the spray track and are presented. Average wind speed during experiments on 2 m height was 3.4 m · s$^{-1}$ (1.4–6.4 m · s$^{-1}$).

**Table 2.**
Average weather conditions during spray drift field experiments

| Nozzle type | Air assist. | Sprayer speed [km · h$^{-1}$] | temperature [°C] at | | RH [%] | wind angle ° to square | windspeed [m · s$^{-1}$] at | |
|---|---|---|---|---|---|---|---|---|
| | | | 0.5 m | 2.0 m | | | 0.5 m | 2.0 m |
| XR 110.04 | – | 6 | 22.3 | 21.3 | 59 | 2 | 2.7 | 3.4 |
| | | 12 | 22.3 | 21.2 | 59 | –1 | 2.5 | 3.3 |
| | + | 6 | 23.0 | 22.2 | 51 | 3 | 2.7 | 3.4 |
| | | 12 | 23.1 | 22.3 | 52 | 3 | 2.3 | 3.3 |
| DG 110.04 | – | 6 | 22.0 | 21.3 | 57 | –9 | 2.6 | 3.3 |
| +IS 80.04 | | 12 | 22.1 | 21.4 | 57 | –9 | 2.6 | 3.3 |
| | + | 6 | 22.7 | 22.1 | 64 | –17 | 2.9 | 3.5 |
| | | 12 | 22.6 | 22.1 | 63 | –16 | 3.1 | 3.8 |

### Presentation of results

Spray deposits were calculated and presented as percentage deposit of the applied volume rate per unit surface-area on the different distances of the collectors. As a comparison to the reference situation spray drift reduction was calculated for the zones 1–5 m, 1.5–6 m and 2.5–3.5 m, 3–4 m from the last nozzle being the zones where in the Netherlands most often a ditch (4 m wide) with surface water (1 m wide) is located. Differences were analysed with a standard statistical package [GENSTAT, analysis of variance; Payne et al. 1993 or IRREML; Keen and Engel 1998] at a 95% confidence interval.

## Results

### Sprayer boom movement

During spray drift measurements boom height and sprayer speed were recorded, the results are presented in table 3.

During measurements little boom movement occurred. No significant differences were found between vertical and horizontal movements for the two speeds. Standard deviation of the average horizontal boom movement was 4.4 cm (2.6–7.0) for the 6 km · h$^{-1}$ speed and 8.1 cm (3.5–15.2) for the 12 km · h$^{-1}$ sprayer speed. Average vertical boom movement was 5.1 cm (2.9–11.6). Typically average boom height was more than 10 cm lower for the air-assisted sprayings than for the conventional indi-

**Table 3.**
Measured sprayer boom speed, variation in horizontal and vertical boom movement and average boom height during spray drift measurements

| nozzle | Air assist. | Speed [km · h$^{-1}$] | horizontal [std in cm] | vertical [std in cm] | Avg. Boom height [cm] |
|---|---|---|---|---|---|
| XR 10.04 | – | 6.0 | 4,4 | 4,9 | 45 |
| | | 11.7 | 8,1 | 4,4 | 48 |
| | + | 6.0 | 4,4 | 5,0 | 37 |
| | | 11.7 | 8,4 | 5,7 | 30 |
| DG 10.04 | – | 6.0 | 4,5 | 5,0 | 44 |
| +IS8004 | | 11.7 | 8,3 | 4,9 | 52 |
| | + | 6.0 | 4,4 | 5,8 | 37 |
| | | 11.7 | 7,5 | 4,8 | 35 |

cating a tilted position (not observed in the field), which can influence spray drift deposition.

## Spray drift deposition

Average spray drift deposition at different distances next to the field is presented in figure 1. A steeper decrease in spray drift curve in the first 2 m distance is clear for the DG11004 nozzle. This is predominantly because of the use of an end-nozzle, preventing overspray at the edge of crop canopy. Lower levels of spray drift from 2 m onwards are because of nozzle type and the use of air assistance. The higher sprayer speed (12 km · h$^{-1}$) results in significant higher spray drift deposition next to the field compared to a sprayer speed of 6 km · h$^{-1}$. This is true for nozzle types, standard flat fan (XR11004) and pre-orifice flat fan (DG11004), and both nozzle types in combination with the use of air assistance (Hardi Twin Force).

Calculated average spray drift deposition on zones coinciding with distances where ditches (1–5 m, 1.5–6 m) and surface water (2.5–3.5 m, 3–4 m) are situated depending on the crop-free buffer zone of respectively 1.0 m or 1.5 m are presented in table 4.

Air assistance results in spray drift deposition levels significantly lower than for conventional spraying, both with sprayer speeds of 6 km · h$^{-1}$ as with speeds of 12 km · h$^{-1}$, irrespective of nozzle type. With both 6 km · h$^{-1}$ and 12 km · h$^{-1}$ sprayer speed the conventional spraying with a pre-orifice flat fan nozzle produced on all zones a lower spray drift deposition than the standard flat fan nozzle, this is however

**Table 4.**
Averaged spray drift deposition (% of volume application rate) on different zones next to the field (m distance from the last nozzle) spraying potatoes with a standard sprayer speed [6 km · h$^{-1}$] and a high sprayer speed [12 km · h$^{-1}$] with different nozzle types, conventional or with air assistance

| nozzle | Air assist. | Speed [km · h$^{-1}$] | Spray drift deposition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2½–3½ m | | 1–5 m | | 3–4 m | | 1½–5½ m | |
| XR 11004 | – | 6 | 3.21 | a | 6.40 | a | 2.42 | a | 3.85 | a |
| | | 12 | 4.70 | b | 8.25 | b | 3.65 | b | 5.47 | b |
| | + | 6 | 0.25 | c | 1.72 | c | 0.18 | ce | 0.78 | ce |
| | | 12 | 2.50 | a | 3.99 | d | 1.55 | d | 2.78 | a |
| DG 11004 | – | 6 | 0.87 | d | 1.47 | c | 0.73 | d | 0.88 | c |
| +IS 8004 | | 12 | 4.04 | ab | 5.73 | ad | 3.17 | a | 3.91 | a |
| | + | 6 | 0.09 | e | 0.10 | e | 0.08 | c | 0.09 | d |
| | | 12 | 0.40 | cdf | 0.68 | f | 0.30 | e | 0.41 | e |

*) Different letters in the same column are significantly different ($\alpha<0,05$).

not significant on the zone 2.5–3.5 m from the last nozzle. Also in combination with air assistance the pre-orifice nozzle produces significant lower spray drift deposition values than the standard flat fan nozzle with air assistance for both sprayer speeds except for the 6 km · h$^{-1}$ sprayer speed on the zone 3–4 m from the last nozzle.

## Airborne spray drift

Airborne drift measured at 5.5 m distance from the last nozzle is presented in figure 2 and averaged over height (0–6 m) presented in table 5. All combinations of the 12 km · h$^{-1}$ sprayer speed gave higher values of airborne drift than the same technique with 6 km · h$^{-1}$ sprayer speed. For both sprayer speeds the use of air assistance resulted in significant lower levels of airborne spray drift than with conventional use of the same nozzle types. When spraying conventionally for both the standard flat fan as the pre-orifice flat fan nozzle, airborne spray drift was higher when sprayer speed was 12 km · h$^{-1}$ instead of 6 km · h$^{-1}$, however differences were not significant. In combination with air assistance both nozzle types produced significant higher airborne drift levels at 12 km · h$^{-1}$ than at 6 km · h$^{-1}$. Compared to a standard flat fan nozzle operated conventionally at 6 km · h$^{-1}$ sprayer speed the pre-orifice flat fan

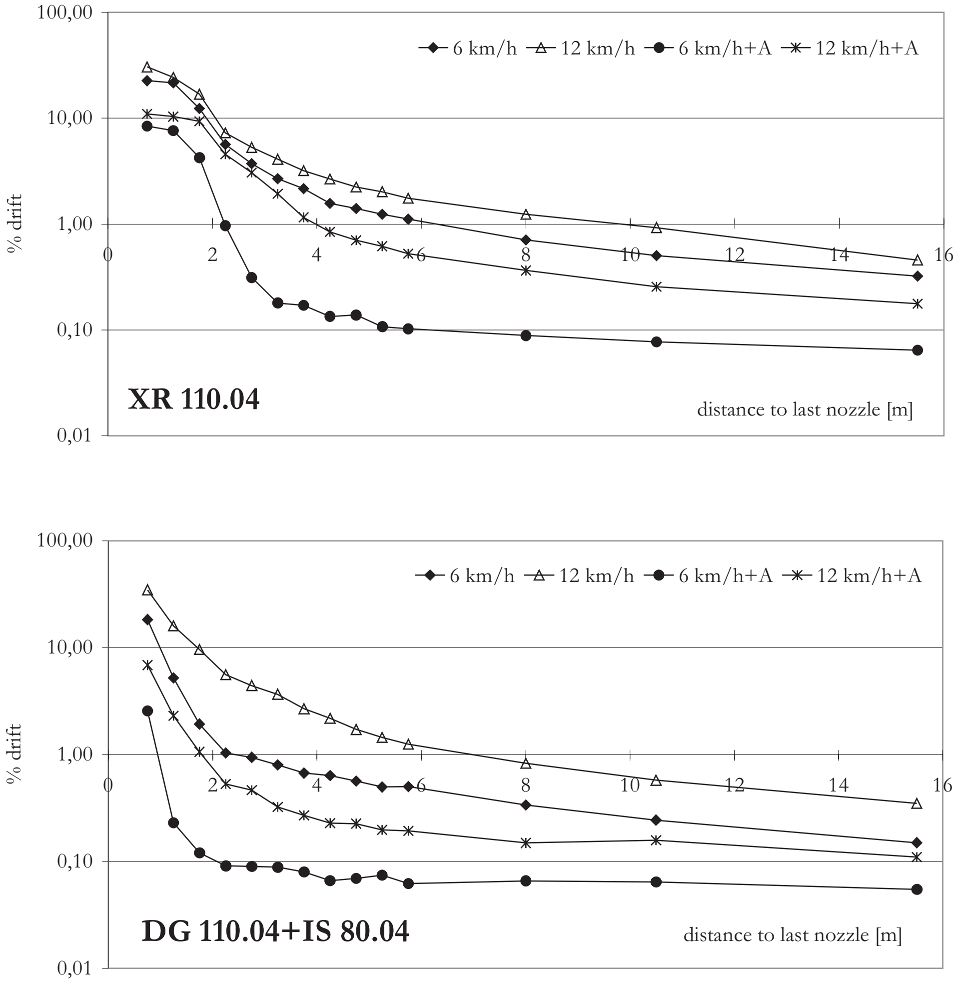


**Figure 1.**
Spray drift deposition (% of volume application rate) next to a sprayed potato field using a conventional and an air-assisted sprayer at sprayer speeds of 6 km · h$^{-1}$ and 12 km · h$^{-1}$ with standard flat fan XR11004 and pre-orifice flat fan nozzles (DG11004) in combination with an

nozzle operated conventionally at 6 km · h$^{-1}$ sprayer speed the pre-orifice flat fan nozzle resulted in lower drift levels both at 6 km · h$^{-1}$ as with 12 km · h$^{-1}$ speed. This difference was only significant with the 6 km · h$^{-1}$ speed. In combination with air assistance the pre-orifice flat fan nozzle produced lower airborne drift levels than the standard flat fan nozzle with air assistance both at 6 km · h$^{-1}$ and 12 km · h$^{-1}$, however difference was not significant at 6 km · h$^{-1}$ speed.

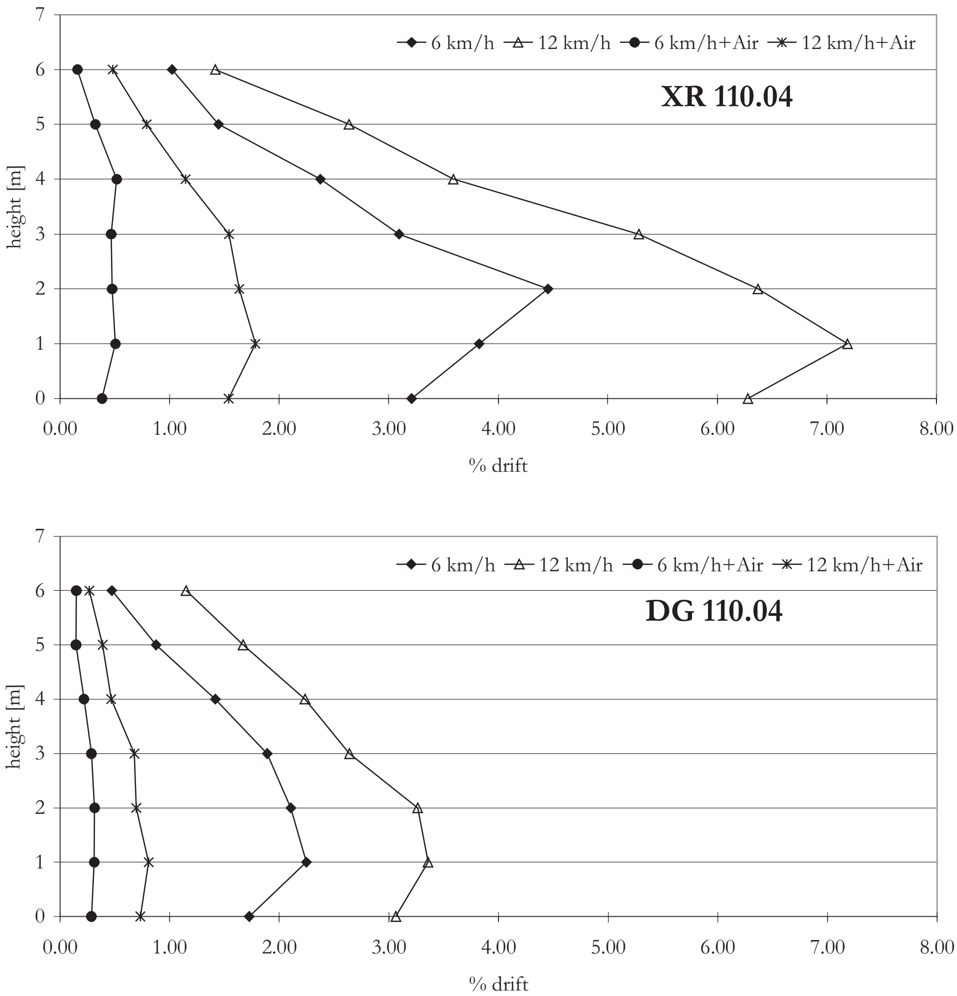


**Figure 2.**
Airborne spray drift deposition (% of volume application rate) at 5.5 m distance from the last nozzle next to a sprayed potato field using a conventional and an air-assisted sprayer at sprayer speeds of 6 km · $h^{-1}$ and 12 km · $h^{-1}$ with standard flat fan XR11004 and pre-orifice flat fan nozzles (DG11004) in combination with an end-nozzle (IS8004)

**Table 5.**
Airborne spray drift (% of volume application rate averaged over 0–6 m height) measured at 5.5 m distance from the last nozzle spraying a potato field with a boom sprayer at 6 and 12 km · h$^{-1}$ driving speed with different combinations of nozzle types and air assistance

| nozzle | air | speed | 0–6 m* | |
|---|---|---|---|---|
| XR 110.04 | – | 6 | 2,76 | a |
| | – | 12 | 4,88 | a |
| | + | 6 | 0,37 | bde |
| | + | 12 | 1,31 | c |
| DG 110.04 | – | 6 | 1,54 | c |
| +IS 80.04 | – | 12 | 2,47 | ac |
| | + | 6 | 0,23 | d |
| | + | 12 | 0,58 | e |

*Different letters mean significant difference ($\alpha < 0,05$).

# Discussion

## Spray drift reduction

Spray drift deposition at different distances next to the field can be expressed as spray drift reduction compared to the reference situation, the standard sprayer using XR11004 flat fan nozzles at 3 bar pressure. In tables 6–9 the drift reduction was calculated for the zones where the ditch (4 m wide) and surface water (1 m wide) can be situated when a 1m or 1,5 m crop-free buffer zone is used. In table 6 the drift reduction is presented for the different combinations of nozzle type and air assistance for the 12 km · h$^{-1}$ sprayer speed compared to the reference situation. Effects of sprayer speed, nozzle type and air assistance are also evaluated separately in tables 7–9.

## Drift reduction compared to reference situation

Compared to the reference situation (table 6) a travel speed of 12 km · h$^{-1}$ increased spray drift deposition next to the field when both a flat fan nozzle (XR11004) and a pre-orifice flat fan nozzle (DG11004) were used in conventional spraying. The use of air assistance in combination with these nozzle types resulted at a sprayer speed of 12 km · h$^{-1}$ in drift reductions on the different zones of 22–38% and 88–89% for the XR11004 and DG11004 nozzle types respectively. Airborne spray drift was reduced by 52% and 79% respectively for the XR11004 and DG11004 nozzle types at a sprayer speed of 12 km · h$^{-1}$.

**Table 6.**
Drift reduction of the combinations of nozzle type, and air assistance at a sprayer speed of 6 and 12 km · h$^{-1}$ compared to the reference situation (conventional XR11004 and 6 km · h$^{-1}$) on the zones 2½–3½, 1–5, 3–4 and 1½–5½ m from the last nozzle and airborne drift at 5.5 m distance from the last nozzle downwind of the sprayed field

| nozzle | Air | Speed [km · h$^{-1}$] | Spray drift reduction [%] at | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2½–3½ | 1–5 | 3–4 | 1½–5½ | Airborne at 5,5 |
| XR 110.04 | – | 12 | –46 | –29 | –51 | –42 | –77 |
| | + | 6 | 92 | 73 | 93 | 80 | 86 |
| | + | 12 | 22 | 38 | 36 | 28 | 52 |
| DG 110.04 | – | 6 | 73 | 77 | 70 | 77 | 44 |
| | – | 12 | –26 | 10 | –31 | –2 | 11 |
| | + | 6 | 97 | 98 | 97 | 98 | 92 |
| +IS 80.04 | + | 12 | 88 | 89 | 88 | 89 | 79 |

## Effect of sprayer speed

In table 7 the effect of sprayer speed is expressed as the drift reduction compared to the same nozzle and spray technique at 6 km · h$^{-1}$ sprayer speed. The level of increase in spray drift deposition was for the XR11004 nozzle used conventional lower (29–51%) than for the other combinations (132–900%). The increase of spray drift because of an increase in sprayer speed was for both nozzle types used conventional lower than for the air assisted spray techniques. This was also clear for the airborne drift.

**Table 7.**
Effect of sprayer speed (12 km · h$^{-1}$ vs 6 km · h$^{-1}$) on spray drift reduction used with different combinations of nozzle types and air assistance to soil surface next to a sprayed field on the zones 2½–3½, 1–5, 3–4 and 1½–5½ m from the last nozzle and of the airborne drift at 5,5 m from the last nozzle

| nozzle | air | Speed [km · h$^{-1}$] | Spray drift reduction [%] at | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2½–3½ | 1–5 | 3–4 | 1½–5½ | airborne |
| XR 110.04 | – | 12 | –46 | –29 | –51 | –42 | –77 |
| | + | 12 | –900 | –132 | –761 | –256 | –252 |
| DG 110.04 | – | 12 | –364 | –290 | –334 | –344 | –61 |
| | + | 12 | –344 | –580 | –275 | –356 | –153 |

## Effect of nozzle type

Spray drift reduction of the pre-orifice flat fan nozzle (DG11004) compared to the standard flat fan nozzle (XR11004) both used conventional is presented in table 8. With 6 km/h travel speed drift reduction of the DG11004 is for the different zones 70–77%. At 12 km · h$^{-1}$ sprayer speed drift reduction of the DG11004 is only 13–31%. The drift reduction of airborne drift was little affected by sprayer speed, respectively 44 and 49% drift reduction at 6 and 12 km · h$^{-1}$. This means that drift reduction classification of nozzle types is affected by sprayer speed.

**Table 8.**
Drift reduction of the pre-orifice flat fan nozzle (DG 110.04 used conventional) compared to the standard flat fan nozzle (XR 110.04 used conventional) on the zones 2½–3½, 1–5, 3–4 and 1½–5½ m from the last nozzle and airborne drift at 5.5 m distance from the last nozzle downwind of the sprayed field

| Speed [km · h$^{-1}$] | Spray drift reduction [%] at | | | | |
|---|---|---|---|---|---|
| | 2½–3½ | 1–5 | 3–4 | 1½–5½ | airborne |
| 6 | 73 | 77 | 70 | 77 | 44 |
| 12 | 14 | 31 | 13 | 29 | 49 |

## Effect of air assistance

In table 9 the drift reduction of the use of air assistance on a boom sprayer is presented, evaluated for the use of air in combination with the same nozzle-speed combination without air. With the standard flat fan nozzle the use of air assistance reduced spray drift on the different zones with sprayer speed of 6 km · h$^{-1}$ in the range

**Table 9.**
Drift reduction of air assistance compared for the different speeds and the pre-orifice flat fan nozzle (DG 110.04) and the standard flat fan nozzle types (XR 110.04) on the zones 2½–3½, 1–5, 3–4 and 1½–5½ m from the last nozzle and airborne drift at 5.5 m distance from the last nozzle downwind of the sprayed field

| nozzle | Speed [km · h$^{-1}$] | Spray drift reduction [%] at | | | | |
|---|---|---|---|---|---|---|
| | | 2½-3½ | 1-5 | 3-4 | 1½-5½ | airborne |
| XR 110.04 | 6 | 92 | 73 | 93 | 80 | 86 |
| | 12 | 47 | 52 | 58 | 49 | 73 |
| DG 110.04 | 6 | 90 | 93 | 89 | 90 | 85 |
| +IS 80.04 | 12 | 90 | 88 | 91 | 90 | 77 |

of 73–93%. With 12 km · $h^{-1}$ travel speed the drift reduction to soil surface next to the field was for the different zones 47–58%. With the pre-orifice flat fan nozzle the use of air assistance reduced spray drift on the different zones and sprayer speed of 6 km · $h^{-1}$ in the range of 89–93%. With 12 km · $h^{-1}$ travel speed the drift reduction to soil surface next to the field was for the different zones 88–91%.

Drift reduction of airborne drift was reduced from 85% for 6 km/h to 73–77% at 12 km · $h^{-1}$ for respectively the standard flat fan nozzle and the pre-orifice nozzle. The drift reduction capability was for the standard flat fan nozzle speed dependent. In combination with the pre-orifice flat fan nozzle there was no effect of sprayer speed on spray drift reduction because of air assistance.

## Conclusions

Based on the results presented it is clear that when reference situations (CIW 2003; ISODIS22866) are defined for comparative drift studies not only nozzle type, boom height, and field conditions are important but also sprayer speed. Results show an increase in spray drift with increasing speed. However effects differ for nozzle types. The drift reduction effect of the low drift nozzle could not compensate for the increase in spray drift because of the increase in sprayer speed. The drift reduction because of the use of nozzle type or air assistance decreased with increasing sprayer speeds. Drift reduction classification differs therefore for different sprayer speeds.

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