The effect of adjuvants on drop size spectrum and spray drift

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Aim

Retention and coverage on leaves can be improved by adding surface-active adjuvants to the pesticide. Such additives may affect drop size distribution and consequently spray drift. This study investigates the effects of several potential adjuvants on drop size spectrum and spray drift.

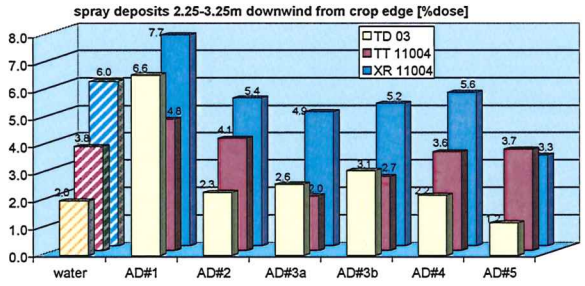
Materials & methods

Five experimental additives were used in tap water (Table 1). Drop size characteristics of the sprays were measured by phase-doppler anemometry, for three different nozzle types (Table 2). Measured spectra are represented by the volume median diameter, the percentage of spray volume consisting of drops smaller than 100 μm diameter, and the average droplet velocity 4 cm below the nozzle.
Downwind spray deposits were calculated using the IDEFICS spray drift model, developed by IMAG-DLO. Spray drift was represented by the relative dose of spray deposited 2.25-3.25 m downwind from the edge of the crop, with crop height 0.5 m, boom height 0.75 m above the crop, driving speed 1.5 m/s, wind speed 3 m/s, temperature 15°C, and RH 60%.

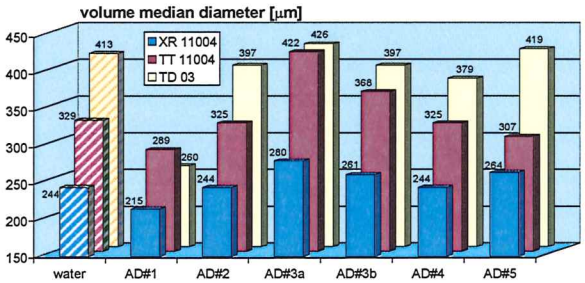
Table 1. List of additives used

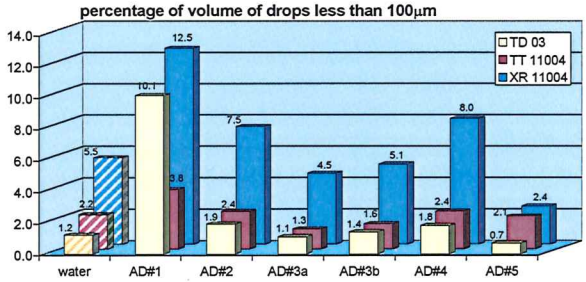
Code	adjuvant	Concentration [%]	surface tension [2] [mN/m]	temperature [°C]
W	tap water	-	72	21
AD#1	Agrimax ISP	0.25	30	22
AD#2	latex copolymer	0.1	40	22
AD#3a/b[1]	polymer mix	0.35 g/l	50	20
AD#4	organosilicone copolymer	0.1	23	22
AD#5	rape oil	0.5	38	20

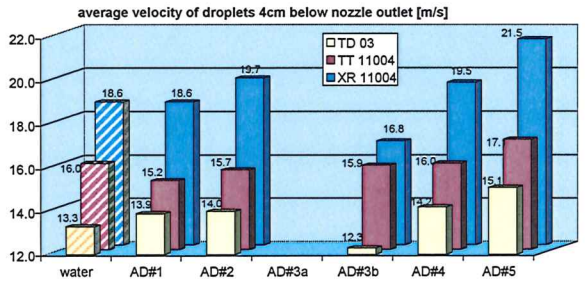
[1] *indices a,b represent first and second day*
[2] *Du Nouy's ring method*



This research was carried out by order of CEBECO AgroChemie BV, by whom also the additives were supplied, and Stefes Nederland BV.







Results

Adjuvant #1 decreases drop size and consequently increases spray drift, with respect to tap water. Adjuvants #2 and #4 have only minor effects on drop sizes and spray drift. Adjuvant #3 shows a slight tendency to increase drop size and decrease spray drift, however, after one day's use these effects become less pronounced. Adjuvant #5 tends to decrease spray drift, partly due to decreasing number of small drops and increasing velocity at the nozzle outlet.

Conclusion

Surface-active additives can significantly affect spray characteristics and, consequently, affect spray drift, yet still dependent on nozzle type.

Table 2. Nozzles used in spraying experiments

Nozzle type	Code	Pressure [kPa]	Size class (BCPC)
Flat fan	XR 11004 [1]	300	Medium
Flat spray	TT 11004 [1]	300	Coarse
Air induction	TD 03 [2]	500	Very coarse

[1] *Spraying Systems;* [2] *Agrotop*

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