Investigations of application techniques for tall corn crops

Untersuchung von Applikationstechniken für hohe Maisbestände

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The treatment of adults of the corn rootworm on large areas requires high power of impact of plant protection equipment (Fig. 1). In addition to the features of the device such as reliability, tank capacity and maneuverability as well as the driving speed especially the volume rate is very important. Therefore, it should be in the lower range of the specified rate in the approval or authorization of the plant protection product. Since in most cases distance regulations to water bodies or terrestrial structures must be observed, coarse atomizing nozzles must be used, leading to a low degree of coverage on target areas. In addition, the height of the corn crop of up to 3.5 meters requires a good penetration of spray droplets to reach the target areas such as the ears of the corn.

Fig. 1 Specialized sprayer for tall crops during the drift measurements.

Abb. 1 *Spezialspritzgerät für hohe Kulturen während der Driftmessung.*

Setting the volume rate at 200 l/ha will obtain reasonable values of speed (at 7 km/h) and spraying pressure (at 3 bar) for the nozzle size 03. The testing of spray deposition distribution and drift in tall corn crops were therefore carried out with air injection nozzles of this size and three different designs. In addition to a vertical discharging standard injection nozzle a double jet injection nozzle with symmetrical spraying direction (each 30° to the front and rear) and a double jet injection nozzle with asymmetric spraying direction (10° forward, 50° to the rear) were used. The fluorometric measurements of spray deposition were carried out icluding the following parts of 10 corn plants in each case: tassel, upper 6 leaves, tips of the two ears with silks and stalk between the ears of corn. In consideration of the high mobility of the corn rootworm and its feeding sites, due to the achievable vertical distribution, experiments with additional air support to improve the penetration were dispensed. The drift measurements were carried out at distances of 1, 3, 5, 10 and 20 m from the area treated according to the guideline for measuring the direct drift of JKI.

Results of drift measurements

Despite the very high boom position of about 4 m above the ground all three nozzle types achieved a reduction of drift by more than 90% (Fig. 2) compared to standard nozzles. This applies to the entire range of 3 to 20 m from the treated area, which is relevant for standard valuation of drift reduction. The drift reduction classes according to the list of drift reducing devices of the JKI were achieved in any case.

Next to the treated area at a distance of 1 m, the measured values approximately correspond to the standard. The additional use of a rim nozzle at the end of the spraying boom could be an improvement.

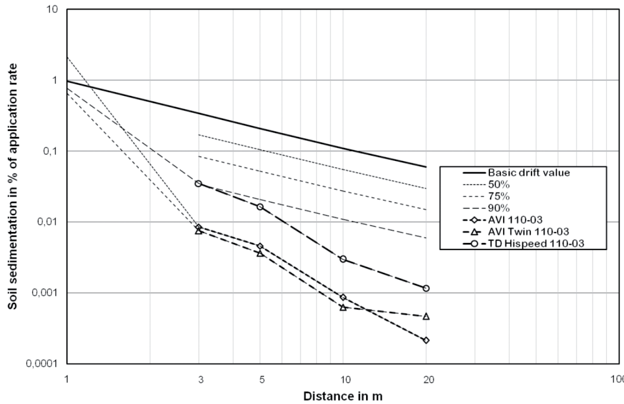

Fig. 2 Results of drift measurements.

***Abb. 2** Ergebnisse der Driftmessungen.*

Results of spray deposition measurements

With all three nozzles types the spray deposits on the leaves decrease from top (flag leaf) to bottom (sixth sheet in the ear area), at the same time showing that the symmetrical double jet injection nozzle generally scored slightly lower depositions than the other two nozzles. These are on the same level at the top, with increasing depth of penetration there are benefits on the leaves for the vertical spraying nozzle while the double flat spray nozzles converge.

At the ear tips with silk there are only small differences between the nozzles, while the asymmetrical spraying double jet injection nozzle achieves slightly higher deposition at the vertical stalk section of the plant.

Overall, Fig. 3 shows that there is no improvement both in terms of amount of spray deposition and in terms of vertical distribution of double jet injection nozzles compared to standard vertical spraying single jet injection nozzles.

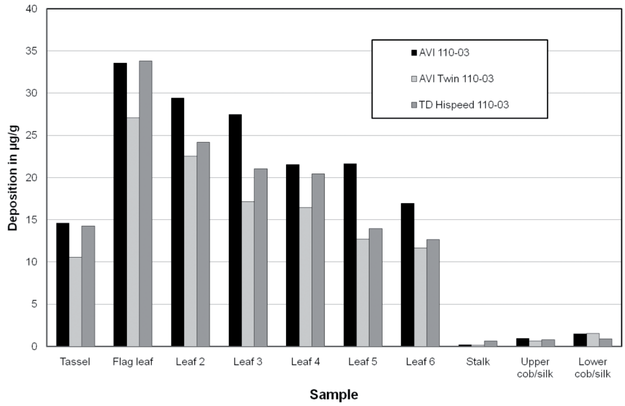

Fig. 3 Influence of nozzle type on spray deposition.

***Abb. 3** Einfluss der Düsentypen auf den Spritzbelag.*