Investigations of Application Techniques for Tall Corn Crops

The situation

The treatment of adults of the western corn rootworm on large areas requires high power of impact of the used plant protection equipment, because there are only a few suitable sprayers available. In addition to general features of the device such as reliability, tank capacity, maneuverability, tire and track width, ground clearance or view of the operator etc. the driving speed and especially the volume rate is very important. The rate should be in the lower range of the specified rate in the approval or authorization of the chosen plant protection product i.e. → „Biscaya“ → 200-400 l/ha → 200 l/ha. The necessity of drift reducing nozzles may lead on one hand to a low degree of coverage on the target areas, while on the other the height of the corn crops 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.

Solutions: Modified grape harvesters – Self propelled sprayers with fixed or variable height (complete sprayer body or cabin and boom separately)

Nozzles

There are several possibilities to set the volume rate at 200 l/ha, but reasonable values of speed and spraying pressure will be obtained for nozzles of size 03. Since distance regulations to water bodies must be observed, only the use of coarse atomizing nozzles is possible. In 2007 therefore the injection nozzle AVI 110-03 was chosen. This nozzle gave good results in tests with water sensitive paper compared to other nozzles. Additionally this nozzle is rated to reduce drift by 75%.

Spray deposition and drift measurements

In 2010 measurements of spray distribution and drift have been carried out comparing the vertical discharging standard injection nozzle (AVI 110-03) with two double jet injection nozzles, one with symmetrical spraying direction (each 30° to the front and rear, AVI Twin 110-03) and the other one with asymmetric spraying direction (10° forwards, 50° backwards, TD Highspeed 110-03). The fluorometric measurements of spray distribution were carried out including the following parts of 10 corn plants in each case: tassel, upper 6 leaves, tips of the two ears with silk and stalk between the ears of corn. The drift measurements included distances of 1, 3, 5, 10 and 20 m from the treated area according to the guidelines for measuring the direct drift of JKI.

Results of deposition measurements

The penetration of every nozzle type is rather good, the deposition on the leaves decreasing from top (flag leaf) to bottom (sixth leaf in the ear area). At the ear tips with silk only small differences between the nozzle types were measured. Finally it was clear, that there is no improvement by using double jet injection nozzles.

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 % compared to standard nozzles. The drift reduction classes according to the list of drift reducing devices of the JKI were achieved in any case.

Conclusion

For treatments of tall corn crops specialized sprayers with high ground clearance are necessary. The state-of-the-art nozzle technique achieves good penetration and spray distribution as well as low drift. In consideration of this and the high mobility of the corn rootworm and its feeding sites an improvement of the application technique by using additional air support is not necessary.

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