Evaluating Reduction of Spray Drift with Colex-D Technology™. S. L. Wilson[1], D.E. Hillger[1], P.L. Havens[1], , K. Qin[1], G.R. Kruger[2] A. J.Hewitt[3]; [1]Dow AgroSciences, Indianapolis, IN, University of Nebraska, North Platte, NE, [3]The University of Queensland and Lincoln Ventures, Gatton, Queensland, Australia

Summary

Laboratory, wind tunnel, and field evaluations were conducted to determine the level of drift reduction achieved with a new ready-to-use formulation of glyphosate + 2,4-D (GF-2726) as compared to a tank mix of glyphosate + 2,4-D. In all evaluations, drift from GF-2726 was significantly less than that observed with the tank mix. By combining this improvement in formulation with new, low-drift nozzle technology, physical drift can be reduced by greater than 90% as compared to a tank mix of glyphosate + 2,4-D applied through current flat-fan spray nozzles.

Introduction

Prevention of the off-target movement of herbicides is an important objective for growers and crop protection companies that manufacture these products. Dow AgroSciences is committed to stewardship of the Enlist™ Weed Control System. Enlist Duo™ herbicide featuring Colex-D Technology will be a new herbicide solution with ultra-low volatility, minimized potential for physical drift, decreased odor and improved handling characteristics. A key component of Colex-D Technology is a new 2,4-D choline + glyphosate formulation with patent-pending technology designed to reduce off-target particle movement under typical application conditions. This technology has been thoroughly tested in controlled laboratory experiments as well as in large-scale field trials. The objective of this paper is to summarize the results of these studies to-date.

Materials and Methods

Particle size analysis: Studies were conducted in an enclosed spray chamber utilizing a TeeJet® Technologies XR11004 nozzle applying GF-2726 (2,4-D choline + glyphosate DMA) at a rate of 1640 g ae/ha as compared to a tank mixture of commercially available 2,4-D DMA and glyphosate DMA. Spray pressure was 2.75 bar (276 KPa) and total spray volume was approximately 140 liters/ha. Measurements were made with a Sympatec™ laser diffraction analyzer directed perpendicular to the spray pattern. Comparisons were made on the basis of the percentage of the spray pattern consisting of droplets less than 141 µm as well as the volume mean diameter (VMD).

Wind tunnel evaluation: Studies were conducted in an enclosed spray chamber utilizing a TeeJet® Technologies XR11004, AIXR11004 and TTI11004 nozzle applying GF-2726 (2,4-D choline + glyphosate DMA) at a rate of 1640 g ae/ha as compared to a tank mixture of commercially available 2,4-D DMA and glyphosate DMA. Herbicide treatments were mixed with a 0.2% v/v concentration of rhodamine spray dye Spray pressure was 2.75 bar (276 KPa) and total spray volume was approximately 140 liters/ha. The spray pattern was exposed to a cross air flow of 3 m/s. Depostions were collected on vertical collection arrays at 2m from nozzle and at collection heights of 10, 20, 30, 40, 50 cm above the ground. Spray dye washed from array and fluorescence measured with Turner 450 laboratory fluorometer.

Field evaluation: Treatments consisted of combinations of three nozzle types (medium, coarse, and ultra-coarse, as classified by American Society of Agricultural and Biological Engineers ASAE, Standard S561.1, 1999) with either GF-2726 or a mixture of commercially available 2,4-D DMA and glyphosate DMA. Applications were made with a full-sized commercial sprayer (John Deere model 4370) at 13.2 kph and boom height of approximately 0.9 meters above the ground, 0.6 meters above standing wheat stubble residue. Herbicide treatments were mixed with a 0.2% v/v concentration of rhodamine spray dye and collections of spray deposition were made at 8 m up-wind of treated area, 4.5, 14, 23, 32, 41, 50 m inside treated area, and 0, 1.5, 4.5, 7.6, 15, 30, 76, 122 m downwind of treated. Analysis of concentrations of dye and herbicide on these collectors enabled calculations of the proportions of the application which moved downwind to various distances. Application of a tank mix of currently available glyphosate and 2,4-D amine formulations through standard flat-fan nozzles was given a value of “1” and relative deposition of other formulation by nozzle combinations was compared on a relative basis.

Results and Discussion

In laboratory studies, the amount of spray particles less than 141 µm generated from an application of GF-2726 was reduced by 32% compared to the tank-mix combination of 2,4-D dimethylamine (DMA) + glyphosate DMA using broadcast nozzle tips producing a medium droplet size. In addition, the use of GF-2726 did not significantly increase the Volume Mean Diameter (VMD) which is often important to maintaining efficacy.

In an experiment conducted in a wind tunnel (Figure 1), the treatment with the same formulation and nozzle tip set up created a 57% reduction in amount of spray solution airborne at 2 m from the spray solution release location. Reduction in airborne spray of GF-2726 was 73% less than the 2,4-D DMA + glyphosate DMA treatment when using nozzle tips that produce coarse/very coarse droplet in this wind tunnel study.

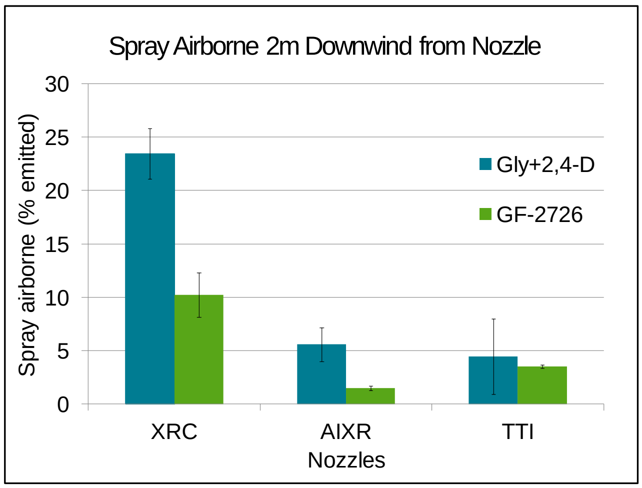

Figure 1. Downwind spray particle movement as affected by nozzle and formulation and measured in a wind tunnel.

A large-scale field study, using standards established by the International Organization for Standards (ISO, Standard 22866, 2005) and ASAEB (ASAE, Standard S572.1, 1999) was conducted in Nebraska using commercial application equipment (John Deere 4730). Three different droplet sizes were evaluated using a 140 L/ha spray delivery volume. The greatest reduction in off-target drift resulted from application of GF-2726 through coarse droplet nozzle tips (Figure 2). Drift reduction was greater than 90% compared to drift of 2,4-D amine DMA + glyphosate DMA applied with medium droplet nozzle tips. Laboratory, wind tunnel and field research results consistently supported superior reduction in the particle drift achieved with the new 2,4-D choline + glyphosate formulation.

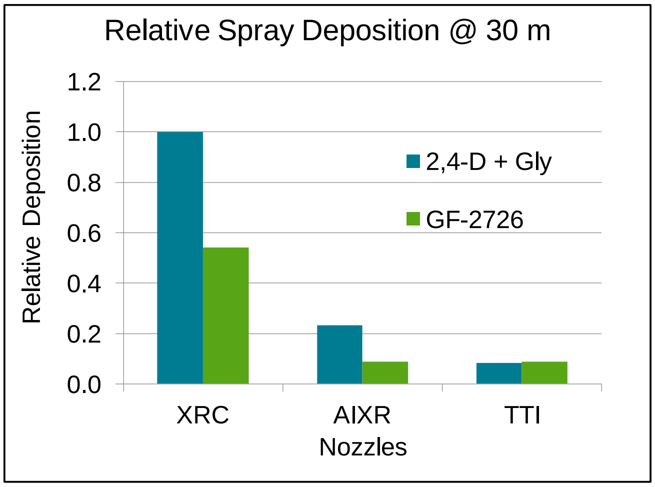

Figure 2. Relative downwind spray deposition of various nozzle and formulation combinations from in-field applications.

Conclusions

Physical drift of spray solutions containing GF-2726 in experiments conducted in laboratory, wind tunnel, and field settings was significantly reduced compared to tank mixtures of commercially available 2,4-D and glyphosate. In combination with new application technologies, the GF-2726 formulation reduced drift by greater than 90% compared to current practices.

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