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Evaluation of Drift Reduction Nozzles for Weed Control in Soybeans

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Abstract
Two studies were conducted to evaluate the effectiveness of drift reduction technologies for weed control in soybeans. The first study compared various nozzle types across two application rates. In the second study a blended-pulse system was compared with conventional spray nozzles. Data presented are a summary of results from 2001 and 2002.

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Introduction

Two studies were conducted to evaluate the effectiveness of drift reduction technologies for weed control in soybeans. The first study compared various nozzle types across two application rates. In the second study a blended-pulse system was compared with conventional spray nozzles. Data presented are a summary of results from 2001 and 2002.

Materials and Methods

The studies were established using a randomized complete block design with three replications. Plot size was 10 ft by 25 ft. Visual estimates of weed control were made July 24. Weed control observations are compared with an untreated control and made on a zero to 100 rating scale with zero percent equaling no weed control. Weed species and populations evaluated included: 75 foxtail, 17 waterhemp, and 1 to 5 velvetleaf and lambsquarters/ft^2.

The soil was a Canisteo Nicollet clay loam with a pH of 6.2 and 5.9% organic matter. The previous crop was corn. Tillage included fall chisel plowing and a spring field cultivation. 'Asgrow AG2101' glyphosate-tolerant soybeans were planted 1.75 inches deep at 190,000 seeds/acre in 30-inch rows.

Treatments were applied using an ATV-mounted compressed-CO_2 sprayer. For all treatments in the nozzle comparison study, pressure was constant for all nozzle treatments, and application rate (GPA) was varied by adjusting sprayer speed. For both studies, herbicide rate per acre was also constant, regardless of nozzle or GPA applied. Weed height was approximately 12 inches at the time of application.

Two herbicide programs were evaluated: Flexstar, a contact herbicide, at 1.25 pt/acre, in combination with Fusion, a systemic grass herbicide, at 8 oz/acre, and Roundup Ultra, a systemic herbicide, at 16 oz/acre. Appropriate additives and adjuvants were included according to label recommendations.

Results

Nozzle comparison (Table 1). Application rate (GPA) did not affect weed control when averaged over all nozzle combinations for the Roundup treatments. Flexstar/Fusion provided greater control of velvetleaf at 20 GPA. All nozzle combinations provided acceptable control in the Roundup treatments. There were no significant differences in control between nozzles in the Flexstar/Fusion treatments.

Blended-pulse comparison (Table 2). Level of control between treatments was more variable in the Flexstar/Fusion treatments than in the Roundup treatments. With the exception of foxtail control, there were no significant differences between pulsing and non-pulsing treatments in the Flexstar/Fusion treatments. In the Roundup treatments, the XR11004 non-pulsing treatment provided less control of lambsquarter than the other applications. The XR11001 non-pulsing application resulted in poorer control of velvetleaf.

Discussion

With a few exceptions, the drift reduction technologies evaluated provided control similar to conventional or 'traditional' nozzles. With systemic herbicides, such as Roundup, droplet size and coverage has been less of an issue. These herbicides are also more likely to cause off-target injury when drift occurs. Contact herbicides, which do not translocate throughout the plant, need good coverage for adequate weed control. Broadleaf control with Flexstar was generally equal across the nozzle types tested. The foxtail was more sensitive to droplet size and coverage in the blended-pulse study. Leaf size and orientation may impact the amount of herbicide intercepted when compared with broadleaf weeds.

The results of these studies show that drift-reduction nozzles, such as Turbo TeeJets and air-induction nozzles, can be used to reduce drift without significantly impacting herbicide efficacy.

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Table 1. Comparison of four nozzle types and two application rates across two herbicide programs.

Treatment	Foxtail	Velvetleaf	Waterhemp	Lambsquarters
Roundup applications				
10 GPA	98	89	93	97
20 GPA	98	92	93	97
LSD (0.05)	1	4	3	2
Extended range flat-fan (XR)	97	89	91	95
Turbo TeeJet (TT)	98	90	94	97
Air Induction TeeJet (AI)	98	92	92	98
TurboDrop (TD)	99	92	95	97
LSD (0.05)	2	5	3	2
Flexstar/Fusion applications				
10 GPA	74	80	76	71
20 GPA	80	87	76	73
LSD (0.05)	7	5	6	5
Extended range flat-fan (XR)	77	85	81	76
Turbo TeeJet (TT)	81	85	74	70
Air Induction TeeJet (AI)	73	80	74	71
TurboDrop (TD)	75	84	76	72
LSD (0.05)	9	8	8	7

Table 2. Comparison of equivalent blended-pulse and conventional applications in two herbicide systems.

Treatment	Foxtail	Velvetleaf	Waterhemp	Lambs-quarters
Roundup applications				
XR 11004 at 100% (non-pulsing)	98	96	94	87
XR 11004 at 50%	96	95	96	95
XR 11002 at 100% (non-pulsing)	96	90	95	95
XR 11004 at 25%	99	99	96	96
XR 11001 at 100% (non-pulsing)	95	90	93	92
LSD (0.05)	5	6	5	5
Flexstar/Fusion applications				
XR 11004 at 100% (non-pulsing)	84	94	83	75
XR 11004 at 50%	86	84	81	73
XR 11002 at 100% (non-pulsing)	80	89	84	66
XR 11004 at 25%	73	89	75	66
XR 11001 at 100% (non-pulsing)	73	94	78	65
LSD (0.05)	9	10	10	12