Herbicide drift reduction methods. Fietsam, John F., Bryan G. Young, and Joseph L. Matthews. These studies were designed to evaluate the efficacy associated with glyphosate applications performed using drift reduction type nozzles and drift control spray additives. Two studies were conducted at the Belleville Research Center in 2002. The herbicides were broadcast applied with a CO_2 pressurized sprayer using one of four 110015 nozzles (flat fan, turbo teejet, air induction or drift guard) at 40 PSI in 10 GPA water. Application timing was 6 to 8 inch weeds (6-8"W). Monthly rainfall in inches was 4.9, 6.6, 1.7, 3.7 and 3.6 in April, May, June, July and August, respectively.

Study 1 was conducted on a Weir silt loam with 1.9% organic matter and pH 7.1. Fertilizer applied was 50 and 150 lb/A P_2O_5 and K_2O, respectively, to an area that had been cropped to soybean in 2001. Bergmann-Taylor brand 'B-T 371CR' glyphosate-resistant soybean was planted 1.0 inch deep at 75 lb/A into a reduced-till seedbed on June 4. Plots consisted of four rows with 30 inch row spacing, 25 ft long arranged in a randomized complete block design with 4 replications. Weed population per 0.25 m^2 in the nontreated plots, mid-season, was 38 giant foxtail, and >100 common waterhemp.

Study 2 was conducted on an Ebbert silt loam with 1.4% organic matter and pH 5.7. Fertilizer applied was 50 and 150 lb/A P_2O_5 and K_2O, respectively to an area that had been cropped to corn in 2001. Bergmann-Taylor brand 'B-T 371CR' glyphosate-resistant soybean was planted 1.0 inch deep at 75 lb/A into a reduced-till seedbed on June 3. Plots consisted of four rows with 30 inch row spacing, 30 ft long arranged in a randomized complete block design with 4 replications. Weed population per 0.25 m^2 in the nontreated plots, mid-season, was 53 giant foxtail, 10 common cocklebur, 1 velvetleaf and 7 ivyleaf morningglory.

Application information is listed below.

Study 1	
Date	Jul-4-02
Treatment	6-8"W
Air temperature (F)	81
Relative humidity (%)	62
Soil moisture	dry
soybean	
leaf no.	V3
height (inch)	6-8
giant foxtail	
leaf no.	5-7
height (inch)	7-14
common waterhemp	
leaf no.	6-9
height (inch)	4-8

Study 2	
Date	Jul-1-02
Treatment	6-8"W
Air temperature (F)	92
Relative humidity (%)	36
Soil moisture	dry
soybean	
leaf no.	V2-V3
height (inch)	3-5

(continued)

Study 2 (continued)

giant foxtail	
leaf no.	3-7
height (inch)	2-8
common cocklebur	
leaf no.	2-6
height (inch)	1-6
velvetleaf	
leaf no.	5-6
height (inch)	3-5
ivyleaf morningglory	
leaf no.	0-8
height (inch)	1-4

Study 1. In general, the addition of a drift retardant did not reduce control of giant foxtail with glyphosate when applied using XR Flat Fan or Drift Guard nozzles. Variable increases in control of giant foxtail were observed from combinations of nozzles and agents ranging from 4 to 7% at 28 days after treatment (DAT). The use of drift reduction nozzles with glyphosate alone did not reduce giant foxtail control compared to similar treatments with flat fan nozzles. Similarly, control of common waterhemp was not reduced with the use of drift reduction nozzles in combination with glyphosate alone at 14 DAT. However, by 28 DAT reduced control of common waterhemp was evident with the use of Drift Guard nozzles. Common waterhemp control 28 DAT was also reduced with the addition of either 30% polyacrylamide (PA) at 4 oz/100 gal or hydroxypropyl guar (HPG) at 10.3 oz/100 gal to glyphosate applied with Turbo TeeJet nozzles, and with any rate of PA or HPG applied with Air Induction nozzles. Soybean yield was 42 bu/A in handweeded plots and 16 to 24 bu/A in herbicide treated plots. All herbicide treated plots yielded similar to glyphosate alone applied with flat fan nozzles regardless of nozzle type or addition of drift retardant.

Study 2. Reduced control of giant foxtail was observed with all drift reduction nozzle types at 28 DAT compared to glyphosate alone applied with XR Flat Fan nozzles. The most noticeable reductions in giant foxtail control occurred with the addition of PA at 4 oz/100 gal to glyphosate applied using Turbo TeeJet or Air Induction nozzles. The use of Drift Guard nozzles reduced control of common cocklebur at 28 DAT from glyphosate alone by 6% compared to glyphosate applied with XR Flat Fan nozzles. Reductions in control of common cocklebur were also observed with the addition of PA at 4 oz/100 gal to glyphosate applied using Turbo TeeJet nozzles. The addition of PA to glyphosate at a rate of 4 oz/100 gal reduced velvetleaf control at 28 DAT by 7 to 10% regardless of nozzle type. Velvetleaf control was also reduced with the addition of HPG at 10.3 oz/100 gal to glyphosate applied with XR Flat Fan or Drift Guard nozzles. Ivyleaf morningglory control was increased at 28 DAT with the addition of PA at 2 oz/100 gal to glyphosate applied with XR Flat Fan nozzles compared to the standard treatment of glyphosate alone applied with XR Flat Fan nozzles. As evidenced in these studies, the use of drift reduction nozzles and agents does significantly influence glyphosate efficacy, however the extent of this influence may vary on a species dependent basis. Soybean yield was 48 bu/A in handweeded plots and 24 to 31 bu/A in herbicide treated plots. Similar to Study 1, all herbicide treated plots yielded similar to glyphosate alone applied with flat fan nozzles. (Dept. of Plant, Soil and General Agriculture, Southern Illinois University, Carbondale)

Table 1. Herbicide drift reduction nozzles and agents. (Fietsam, Young and Matthews)

			Study 1[b]							Study 2[b]			
				SETFA			AMATA				SETFA		
				Control		Plants	Control		Plants		Control		Plants
	Application		Soybean	DAT			DAT			Soybean	DAT		
Treatment[a]	Rate	Time	yield	14	28	21	14	28	21	yield	14	28	21
	(lb/A)		bu/A	%	%	1 m^2	%	%	1 m^2	bu/A	%	%	1 m^2
Nontreated			3	0	0	257	0	0	533	1	0	0	197
Handweed			42	99	99	0	99	99	0	48	99	99	0
Flat fan nozzles													
Glyphosate	0.188	6-8"W	18	83	87	38	60	58	211	27	95	93	41
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	18	80	87	34	64	58	248	28	95	89	75
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	24	90	93	2	56	48	348	30	97	93	14
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	23	83	88	18	59	54	188	28	96	94	25
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	24	88	93	12	62	49	201	31	96	95	17
Turbo teejet nozzles													
Glyphosate	0.188	6-8"W	23	87	91	5	68	52	200	27	94	90	51
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	20	89	91	36	58	51	227	24	94	90	43
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	17	79	85	34	49	41	279	25	93	82	85
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	19	81	89	17	61	58	335	25	94	89	38
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	18	73	85	21	54	43	228	27	93	88	43
Air induction nozzles													
Glyphosate	0.188	6-8"W	18	80	86	34	60	53	243	31	94	89	28
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	16	73	84	29	63	53	230	29	93	89	44
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	20	88	91	5	49	33	362	25	92	84	38
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	19	88	93	23	51	45	257	29	94	93	33
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	21	89	89	19	48	34	271	27	95	90	36
Drift guard nozzles													
Glyphosate	0.188	6-8"W	21	88	91	41	54	43	266	27	92	89	80
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	20	90	93	3	55	49	220	28	96	94	20
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	21	83	88	36	53	40	162	29	97	92	53
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	20	86	90	27	61	53	236	24	96	94	31
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	22	84	90	9	56	49	236	26	96	89	44
LSD			6	6	4	69	10	12	170	6	3	3	45
P			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

[a]All glyphosate was Roundup UltraMax.
All nozzles are from Spraying Systems Co.
[b]For Study 1; 14, 28, and 21 days after 6-8"W was on Jul-3-01, Jul-17-01, and Jul-10-01, respectively.
For Study 2; 14, 28, and 21 days after 6-8"W was on Jul-6-01, Jul-20-01, and Jul-13-01, respectively.

Table 2. Herbicide drift reduction nozzles and agents. (Fietsam, Young and Matthews)

			Study 2[b]								
			XANST			ABUTH			IPOHE		
			Control		Plants	Control		Plants	Control		Plants
	Application		DAT			DAT			DAT		
Treatment[a]	Rate	Time	14	28	21	14	28	21	14	28	21
	(lb/A)		%	%	1 m^2	%	%	1 m^2	%	%	1 m^2
Nontreated			0	0	34	0	0	3	0	0	23
Handweed			99	99	0	99	99	0	99	99	0
Flat fan nozzles											
Glyphosate	0.188	6-8"W	92	92	5	79	73	1	54	30	34
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	96	95	5	82	79	1	59	36	30
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	95	95	4	74	63	2	54	28	25
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	92	93	4	78	71	3	51	29	21
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	95	96	1	64	55	5	49	29	25
Turbo teejet nozzles											
Glyphosate	0.188	6-8"W	91	91	11	78	70	2	60	31	19
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	94	88	7	76	69	4	59	30	26
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	88	84	11	76	64	1	60	31	23
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	92	91	4	76	71	4	60	34	19
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	90	92	8	71	71	1	48	28	26
Air induction nozzles											
Glyphosate	0.188	6-8"W	92	93	5	71	69	3	49	30	27
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	93	94	2	73	70	3	46	30	30
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	88	89	3	67	66	2	46	26	23
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	92	95	6	73	70	1	48	30	29
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	85	90	6	66	69	4	48	30	20
Drift guard nozzles											
Glyphosate	0.188	6-8"W	86	86	11	73	68	5	53	29	20
Glyphosate +30% polyacrylamide	0.188 +2.0 oz/100 gal	6-8"W	91	93	5	66	61	6	56	33	23
Glyphosate +30% polyacrylamide	0.188 +4.0 oz/100 gal	6-8"W	93	92	4	67	64	3	58	31	20
Glyphosate +hydroxypropyl guar	0.188 +4.0 oz/100 gal	6-8"W	91	90	7	70	70	3	63	34	20
Glyphosate +hydroxypropyl guar	0.188 +8.0 oz/100 gal	6-8"W	92	92	4	66	65	5	60	31	20
LSD			3	4	8	4	5	4	5	4	14
P			0.01	0.01	0.01	0.01	0.01	0.2	0.01	0.01	0.06

[a]All glyphosate was Roundup UltraMax.
All nozzles are from Spraying Systems Co.
[b]For Study 1; 14, 28, and 21 days after 6-8"W was on Jul-3-01, Jul-17-01, and Jul-10-01, respectively.
For Study 2; 14, 28, and 21 days after 6-8"W was on Jul-6-01, Jul-20-01, and Jul-13-01, respectively.