Reprinted with permission from: Western Society of Weed Science, Research Progress Report. 2000. pp. 7-9.

Published and copyrighted by: Western Society of Weed Science.
http://www.wsweedscience.org

Evaluation of diflufenzopyr with auxin herbicides for leafy spurge control

RODNEY G. LYM

Department of Plant Sciences, North Dakota State University, Fargo, ND 58105.

Diflufenzopyr is an auxin transport inhibitor (ATI), which suppresses the transport of naturally occurring IAA and synthetic auxin-like compounds in plants. In general, diflufenzopyr interferes with the auxin balance needed for plant growth. The purpose of this research was to evaluate diflufenzopyr applied with various auxin herbicides for leafy spurge control.

BAS-662 (formally known as SAN-1269) is a combination of dicamba plus diflufenzopyr (SAN-836) in a ratio of 2.5:1 dicamba:diflufenzopyr. In the first experiment this pre-mixed treatment was compared to diflufenzopyr applied with other auxin herbicides in the same ratio of 2.5: 1. The application rate for all herbicides was reduced approximately 50% from the normal use rate for season-long control to more quickly determine if diflufenzopyr caused increased leafy spurge control when applied with an auxin herbicide. The experiment was established at the Ekre Research Station, near Walcott, ND, on June 12, 1997. The leafy spurge was in the true-flower growth stage and 18 to 36 inches tall. The herbicides were applied using a hand-boom sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 feet and replicated four times in a randomized complete block design. All treatments were applied with the surfactant X-77 plus 28% N at 0.25% + 1.25% (v/v), respectively. Leafy spurge foliage injury was visually evaluated 1 MAT (month after treatment) and control based on percent stand reduction compared to the untreated check was evaluated 3 and 12 MAT.

Leafy spurge foliage injury increased dramatically when diflufenzopyr was applied with an auxin herbicide compared to the herbicide applied alone (Table 1). For example, foliage injury increased from 76 to 93% when diflufenzopyr was applied with dicamba and from 56 to 99% when diflufenzopyr was applied with picloram compared to the herbicides applied alone. The largest increase in foliage injury (38 to 95%) occurred when quinclorac was applied with diflufenzopyr compared to quinclorac applied alone.

Leafy spurge control with dicamba, picloram, and fluroxypyr was better 3 MAT when the herbicides were applied with diflufenzopyr compared to the herbicides applied alone (Table 1). For instance, leafy spurge control with fluroxypyr increased from 28 to 76% 3 MAT when diflufenzopyr was added and from 10 to 47% when diflufenzopyr was applied with picloram. Since the herbicides were applied at below the normal use rate, leafy

spurge control declined rapidly the following growing season. However, control 12 MAT was increased when diflufenzopyr was applied with dicamba and quinclorac and tended to be increased with picloram plus 2,4-D compared to the herbicides applied alone 3 MAT.

Table 1. Leafy spurge control with auxin herbicides applied alone and with diflufenzopyr in June 1997.

		Foliate inj[a]	Control	
Treatnent	Rate	1 MAT[b]	3 MAT[b]	12 MAT[b]
	—-oz/A —-	—— % ——		
Dicamba	4	76	5	0
Dicamba + diflufenzopyr	4+1.6	93	43	38
Picloram	2	56	10	0
Picloram + diflufenzopyr	2+0.8	99	47	6
2,4-D	4	81	40	4
2,4-D + diflufenzopyr	4+1.6	98	45	5
Picloram + 2,4-D	2+4	68	64	3
Picloram + 2,4-D + diflufenzopyr	2+4+0.8	95	71	25
Quinclorac	8	38	88	71
Quinclorac + diflufenzopyr	8+3.2	95	96	90
Fluroxypyr	4	78	28	4
Fluroxypyr + diflufenzopyr	4+1.6	100	76	16
LSD (0.05)		9	34	23

[a]Based on foliage topgrowth injury with 0 = no injury and 100 = all topgrowth killed.
[b] Months after treatment.
[c] Commercial mixture of dicamba plus diflufenzopyr - Distinct (BAS-662).

The second experiment evaluated leafy spurge control with dicamba applied in mid-summer or fall alone or with diflufenzopyr in a commercial mixture. The experiment was established near Fargo in 1997 and herbicides were applied as previously described on July 22 (summer) or September 15 (fall) when leafy spurge was in the true-flower to seed-set or fall regrowth growth stages, respectively. All treatments were applied with surfactant X-77 and 28% N at 0.25% plus 1.25%, respectively. Leafy spurge growth had been delayed in the spring because of flooding in the area.

Leafy spurge foliage injury 1 MAT increased when diflufenzopyr was applied with dicamba compared to dicamba alone, similar to the first study (Tables 1 and 2). Leafy spurge control the following growing season was much better when dicamba was applied with diflufenzopyr compared to dicamba alone, especially for the fall applied treatments (Table 2). For instance, leafy spurge control averaged 96% 11 MAT with dicamba plus diflufenzopyr at 16 plus 6.4 oz/A compared to only 20% with dicamba, applied alone and was similar to the standard treatment of picloram plus 2,4-D. Control 13 MAT was or tended to be increased with all dicamba plus diflufenzopyr treatments compared to dicamba alone. Again, dicamba plus diflufenzopyr at 16 plus 6.4 oz/A provided similar control (61 %) to the standard picloram plus 2,4-D treatment.

The third experiment was established near Valley City, ND on September 17, 1997 when leafy spurge was in the fall regrowth growth stage to evaluate the effect of diflufenzopyr applied with auxin herbicides and imazapic at recommended rates. As observed in the previous studies leafy spurge control increased or tended to increase when diflufenzopyr was applied with an auxin herbicide, especially dicamba and picloram (Table 3). Leafy spurge control averaged 54% 12 MAT when diflufenzopyr was applied with dicamba compared to only 20% when dicamba was applied alone. Control increased from 66 to 90% when diflufenzopyr was applied with picloram compared to the herbicide alone. Leafy spurge control also tended to increase when diflufenzopyr was applied with imazapic even though that herbicide is classified as an ALS inhibitor.

Table 2. Dicamba applied in mid-summer or fall alone and with diflufenzopyr for leafy spurge control.

		Foliage inj[a].	Control	
Time applied and treatment	Rate	1 MAT[b]	11 MAT[b]	13 MAT[b]
	—— oz/A ——	—————— % ——————		
Mid-summer				
Dicamba + diflufenzopyr[c]	4+1.6	36	38	8
Dicamba + diflufenzopyr[c]	8+3.2	80	38	23
Dicamba	4	10	6	3
Dicamba	8	66	23	6
Picloram + 2,4-D	4+16	97	34	18
Fall applied				
Dicamba + diflufenzopyr[c] fall	8+3.2		77	23
Dicamba + diflufenzopyr[c] fall	16+6.4		96	61
Dicamba fall	8		28	8
Dicamba fall	16		20	5
Picloram + 2,4-D fall	8+16		94	63
LSD (0.05)		22	26	20

[a]Based on foliage topgrowth injury with 0 = no injury and 100 = all topgrowth killed.
[b]Months after treatment.
[c]Commercial mixture of dicamba plus diflufenzopyr - Distinct (BAS-662).

The fourth experiment was established to evaluate the optimum ratio of diflufenzopyr with various herbicides. The diflufenzopyr ratio was varied from the standard ratio of 2.5:1 herbicide:ATI to 5:1 and 10:1. The experiment was established near Jamestown and Valley City, North Dakota, in early June 1998 when leafy spurge was in the true-flower growth stage. Both initial foliage injury 1 MAT and top growth control 3 MAT were higher when diflufenzopyr was applied with dicamba and quinclorac compared to the herbicide alone (Table 4). However, injury and control were similar regardless of the diflufenzopyr rate. For instance, leafy spurge control with dicamba applied alone averaged 84% 3 MAT but increased to an average of 97% when applied with diflufenzopyr. Control with quinclorac alone averaged 78% but increased to an average of 97% when

applied with diflufenzopyr. Control was also increased to 78% when diflufenzopyr was applied with glyphosate plus 2,4-D compared to 44% with the herbicides alone.

In summary, both initial and long-term leafy spurge control increased when diflufenzopyr was applied with auxin herbicides and with imazapic. Leafy spurge control 3 MAT was similar regardless of the ratio of diflufenzopyr to herbicide. Diflufenzopyr could be used to increase long-term leafy spurge control with herbicides or allow the use of reduced herbicide rates without a subsequent loss in control.

Table 3. Diflufenzopyr applied with various herbicides in the fall for leafy spurge control.

		Control	
Treatment	Rate	9 MAT[a]	12 MAT[a]
	oz/A	%	
Dicamba + X-77 + 28% N	32 + 0.25% + 1.25%	65	20
Dicamba + diflufenzopyr[b] + X-77 + 28% N	32 + 12.8 + 0.25% + 1.25%	78	54
Picloram	8	89	66
Picloram + diflufenzopyr	8 + 3.2	100	90
Picloram + 2,4-D	8 + 16	95	78
Picloram + 2,4-D, + diflufenzopyr	8 + 16 + 3.2	99	88
Quinclorac + Scoil[c]	16 + 1 qt	99	89
Quinclorac + diflufenzopyr + Scoil[c]	16 + 6.4 + 1 qt	100	95
Imazapic + Sunit[c] + 28% N	2 + 1 qt + 1 qt	95	84
Imazapic + diflufenzopyr + Sunit[c] + 28% N	2 + 0.8 + 1 qt + 1 qt	99	96
LSD (0.05)		14	16

[a]Months after treatment
[b]Commercial mixture of dicamba plus diflufenzopyr - Distinct (BAS-662).
[c]Methylated seed oil by AGSCO.

Table 4. Diflufenzopyr applied at various ratios with herbicides for leafy spurge control averaged over two locations in North Dakota.

		Foliage injury	Control
Treatment	Rate	1 MAT[a]	3 MAT[a]
	oz/A	%	
Dicamba + X-77 + 28% N	2 + 0.25%+ 1 qt	64	84
Dicamba + diflufenzopyr + X-77 + 28% N	2 + 3.2 + 0.25% + 1 qt	67	94
Dicamba + diflufenzopyr + X-77 + 28% N	2 + 6.4 + 0.25% + 1 qt	78	99
Dicamba + diflufenzopyr + X-77 + 28% N	2 + 12.8 + 0.25% + 1 qt	70	98
Quinclorac + Scoil[b]	12 + 1 qt	47	78
Quinclorac + diflufenzopyr + Scoil[b]	12 + 1.6 + 1 qt	61	96
Quinclorac + diflufenzopyr + Scoil[b]	12 + 3.2 + 1 qt	60	97
Quinclorac + diflufenzopyr + Scoil[b]	12 + 4.8 + 1 qt	66	98
Glyphosate + 2,4-D[c]	6+10	88	44
Glyphosate + 2,4-D[c] + diflufenzopyr	6+10+6.4	84	78
LSD (0.05)		8	8

[a]Months after treatment.
[b]Methylated seed oil by AGSCO.
[c]Commercial formulation - Landmaster BW.