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Dikegulac in combination with 2,4-D and picloram for leafy-spurge control[1]

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Previous studies have shown dikegulac (the sodium salt of dikegulac, trade name Atrinal by Maag Agrochemicals, Vero Beach, Florida) to be synergistic with 2,4-D and picloram for leafy spurge control. Dikegulac causes temporary inhibition of plant growth, reduction or elimination of flowering and promotion of axillary plant growth. Leafy spurge response to dikegulac decreases as the plant matures. The purpose of these experiments was to evaluate the synergism of dikegulac with picloram or 2,4-D in the field both as a tank mix and split application.

The experiments were established at Lisbon, ND in an unused quarry with a heavy infestation of leafy spurge. The first two experiments were established on 26 May 1982 when the leafy spurge was in the yellow bract growth stage and before true flower initiation. The plots were 10 by 30 ft, and treatments were replicated four times in a randomized complete block design. The treatments were applied in 8.5 gpa at 35 psi. Evaluations were based on visual percent stand reduction as compared to the control.

Dikegulac at 0.5, 1.0 and 2.0 lb/A was applied alone and tank-mixed with picloram at 1.0 or 2.0 lb/A and 2,4-D at 2.0 lb/A in the first experiment. Leafy spurge plants treated with dikegulac alone at one month after application were stunted and had many axillary branches, and most flowers had been aborted. In general, the number of axillary branches increased as the dikegulac rate increased. By the end of the growing season, plants treated with dikegulac at 2 lb/A still had many axillary branches but plants treated at the lower rates had resumed normal growth. Leafy spurge control was increased when picloram at 1.0 lb/A was applied with dikegulac (Table 1). Leafy spurge control was 19 and 26% at 15 and 29 months following application of picloram at 1.0 lb/A, respectively, but was 73 and 61%, respectively, when averaged across the tank mixtures of dikegulac at 0.5, 1.0, or 2.0 lb/A. Dikegulac tank-mixed with picloram at 2.0 lb/A or 2,4-D did not increase leafy spurge control compared to the herbicides applied alone.

Dikegulac was applied as a tank mix or split treatment with picloram and 2,4-D in the second experiment. Dikegulac alone at 0.5 and 1.0 lb/A was applied on 26 May 1983. Picloram or 2,4-D at 1.0 lb/A were applied on 30 June 1983, as a split treatment alone or as a tank mix treatment with dikegulac. The leafy spurge was in the true flower growth stage and beginning seed set. Dikegulac had no observable effect on leafy spurge when applied on 26 May 1983. However, leafy spurge control with picloram at 1.0 lb/A increased slightly when dikegulac was used as a pretreatment or a tank mix compared to

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picloram applied alone (Table 2). Leafy spurge control with 2,4-D was not affected by dikegulac.

The third experiment was similar to the second experiment with dikegulac alone applied on 7 September 1982 and 2,4-D or picloram applied on 4 October 1982 either alone for the split treatments or tank mixed with dikegulac. Leafy spurge was under moisture stress on 7 September, and the plants were red and yellow with slight frost damage by 4 October. Dikegulac alone did not affect leafy spurge growth or control with picloram and 2,4-D when applied as a fall treatment to mature plants (Table 3).

Dikegulac had plant growth regulator activity on leafy spurge only early in the growing season. Thus, an experiment was begun in 1984 in a pasture near Hunter, ND, to evaluate various combination treatments of picloram and dikegulac applied early in the growing season for leafy spurge control. Treatments were applied either on 10 May when leafy spurge was 4 to 6 inches tall and in the vegetative growth stage, or on 22 May when the plants were 12 to 14 inches tall with yellow bracts but not yet flowering. The experimental design and application methods were similar to those previously described.

Leafy spurge control following early spring application of picloram plus dikegulac was inconsistent (Table 4). Leafy spurge plants treated with dikegulac alone in 1984 were less stunted and had fewer axillary branches compared to similar treatments in 1982. Leafy spurge control tended to increase when dikegulac was applied with picloram at 0.5 lb/A compared to picloram alone. However, control was similar or tended to decline when dikegulac was applied with picloram at 0.75 or 1.0 lb/A.

Although there is a tendency for leafy spurge control to be improved from low rates of picloram plus dikegulac compared to picloram alone, this increase is not as great as when 2,4-D is added to picloram. Also, 2,4-D is more economical than dikegulac as a combination treatment with picloram for leafy spurge control.

Table 1. Leafy spurge control by 2,4-D or picloram applied alone or with dikegulac on 26 May 1982 near Lisbon, ND.

		Control			
		1983		1984	
Treatment	Rate	1 June	22 August	5 June	5 October
	(lb/A)	---------- (%) ----------			
Dikegulac + picloram	0.5+1.0	92	70	64	60
Dikegulac + picloram	0.5+2.0	100	90	68	63
Dikegulac + picloram	1.0+1.0	91	60	76	61
Dikegulac + picloram	1.0+2.0	100	83	87	85
Dikegulac + picloram	2.0+1.0	96	68	78	73
Dikegulac + picloram	2.0+2.0	99	94	90	89
Dikegulac + 2,4-D	0.5+2.0	15	3	3	3
Dikegulac + 2,4-D	1.0+2.0	15	3	0	0
Dikegulac+ 2,4-D	2.0+2.0	2	0	0	0
Dikegulac	0.5	1	0	0	0
Dikegulac	1.0	0	0	0	0
Dikegulac	2.0	2	0	0	0
Picloram	1.0	90	19	27	26
Picloram	2.0	96	98	72	75
2,4-D	2.0	12	0	0	0
LSD (0.05)		13	15	21	23

Table 2. Leafy spurge control by 2,4-D or picloram applied with dikegulac as a pretreatment or tank mix near Lisbon, ND.

		1982	Control	
		Application	1983	1982
Treatment	Rate	date	1 June	22 August
	(lb/A)		---------- (%) ----------	
Dikegulac	0.5	30 June	0	0
Dikegulac	1.0	30 June	7	0
Picloram	1.0	30 June	90	9
2,4-D	1.0	30 June	14	0
Dikegulac + picloram (split)	0.5+1.0	26 May/30 June	94	19
Dikegulac + picloram (split)	1.0+1.0	26 May/30 June	92	16
Dikegulac + picloram (tank mix)	0.5+1.0	30 June	95	18
Dikegulac + picloram (tank mix)	1.0+1.0	30 June	82	9
Dikegulac + 2,4-D (split)	0.5+1.0	26 May/30 June	4	0
Dikegulac + 2,4-D (split)	1.0+1.0	26 May/30 June	4	0
Dikegulac + 2,4-D (tank mix)	0.5+1.0	30 June	1	0
Dikegulac + 2,4-D (tank mix)	1.0+1.0	30 June	9	0
LSD (0.05)			14	10

Table 3. Leafy spurge control by 2,4-D or picloram applied with dikegulac as a pretreatment or tank mix near Lisbon, ND.

Treatment	Rate	1982 Application date	Control 1 June 1983	Control 22 August 1983
	(lb/A)		(%)	
Dikegulac + picloram (tank mix)	0.5+1.0	7 Sept	72	1
Dikegulac + picloram (tank mix)	1.0+1.0	7 Sept	52	4
Dikegulac + picloram (split)	0.5+1.0	7 Sept/4 Oct	47	0
Dikegulac + picloram (split)	1.0+1.0	7 Sept/4 Oct	64	8
Dikegulac + 2,4-D (tank mix)	0.5+2.0	7 Sept	2	0
Dikegulac + 2,4-D (tank mix)	1.0+2.0	7 Sept	2	0
2,4-D	2.0	7 Sept	4	0
Picloram	1.0	7 Sept	57	8
LSD (0.05)			20	3

Table 4. Leafy spurge control by picloram and dikegulac tank mix treatments applied near Hunter, ND.

Treatment	Rate	Application date/control 84: 10 May 84 Aug 1984	10 May 84 May 1985	22 May 84 Aug 1984	22 May 84 May 1985
	(lb/A)	(%)			
Dikegulac	0.25	0	0	1	0
Dikegulac	0.5	1	0	1	0
Dikegulac	1.0	1	2	0	0
Picloram	0.5	16	4	38	14
Picloram	0.75	53	7	31	49
Picloram	1.0	69	68	56	75
Dikegulac + picloram	0.25+0.5	32	16	38	28
Dikegulac + picloram	0.25+0.75	37	1	70	36
Dikegulac + picloram	0.25+1.0	43	0	81	36
Dikegulac + picloram	0.5+0.5	55	18	37	18
Dikegulac + picloram	0.5+0.75	51	31	55	44
Dikegulac + picloram	0.5+1.0	80	67	60	69
Dikegulac + picloram	1.0+0.5	24	5	24	1
Dikegulac + picloram	1.0+0.75	24	6	30	35
Dikegulac + picloram	1.0+1.0	50	36	48	43
LSD (0.05)		34	28	35	35