Herbicidal Control of Western Ragweed in Nebraska Pastures[1]

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Highlight

Western ragweed (*Ambrosia psilostachya* DC.) in a pasture near Lincoln, Nebraska was usually not controlled by 1 lb./acre of (2,4-dichlorophenoxy) acetic acid (2,4-D). Two lb./acre was effective in three of four experiments. One lb./acre of 4-amino-3,5,6-trichloropicolinic acid (picloram) effectively controlled western ragweed. Applications of 3,6-dichloro-*o*-anisic acid (dicamba) were sometimes effective but results were erratic among studies. Two successive applications of all herbicides and rates provided effective control through the growing season of the second treatment.

Control de *Ambrosia psilostachya* DC. con Herbicidas en Pastizales de Nebraska

Resumen[3]

Ambrosia psilostachya DC. es una planta sin valor forrajero considerada como creciente o menos deseable. Se llevaron a cabo 5 experimentos de 1964 a 1967 para evaluar 2 herbicidas: ácido 4-amino-3,5,6 tricloropicolinico (picloram) y ácido 3,6-dicloro-o-anisico (dicamba) en el control de *Ambrosia psilostachya* DC. y a su vez comparar con los resultados obtenidos con el uso de 2,4-D.

Los estudios fueron desarrollados cerca de Lincoln, Nebraska en diseños completamente al azar con cuatro a seis repeticiones. Las formulaciones y proporciones aplicados fueron: 1 y 2 lb./acre del ester 150 propilico de 2,4-D; 0.5, 1.0 y 2.0 lb./acre de la sal de potasio de picloram y 1, 2 y 3 lb./acre de la sal dimetilamina de dicamba. Los herbicidas fueron aplicados a mediados de Junio excepto para un estudio en 1965.

Los tratamientos se evaluaron contando los tallos vivos de Ambrosia en áreas de muestreo de 2×4 pies (0.6×1.22 mts.) antes y después de la aplicación de los herbicidas. Las áreas de observación fueron permanentes.

Para las condiciones en las que se desarrolló el presente trabajo se puede decir qua una lb./acre de 2,4-D, no controla *Ambrosia psilostachya* DC. Dos lbs./acre fueron efectivas en 3 de 4 experimentos. Una lb./acre de picloram fué un control efective. Los resultados obtenidos con Dicamba fueron erráticas. Dos aplicaciones sucesivas de todos los herbicidas y proporciones usados dieron un control efectivo durante la época de crecimiento del segundo tratamiento.

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Western ragweed (*Ambrosia psilostachya* DC.) inhabits much of the western half of the United States with the exception of the northern portion of California and most of Oregon and Washington (U.S.D.A., 1970). It has no forage value, increases as range condition declines (Sims and Dwyer, 1965), and is vigorous enough to obscure desirable grasses (Hazell, 1965). Western ragweed reproduces from rhizomes and achenes (U.S.D.A., 1970). Western ragweed pollen is a problem to those who suffer from hayfever. Research in Oklahoma (Elder, 1951) showed western ragweed could be controlled with 1 lb./acre of (2,4-dichlorophenoxy) acetic acid (2,4-D). Bovey et al. (1966) indicated that a single application of 2,4-D at 1 lb./acre controlled western ragweed in Nebraska for up to three years.

Klingman and McCarty (1958) observed western ragweed which was not controlled with successive annual applications of 2,4-D in a study near Lincoln, Nebraska. Their experiment has been continuously evaluated for the last 20 years and western ragweed has persisted in plots treated each year with 1 lb./acre of 2,4-D.

We conducted five experiments from 1964 through 1967 to evaluate 4-amino-3,5,6-trichloropicolinic acid (picloram) and 3,6-dichloro-*o*-anisic acid (dicamba) for control of western ragweed and to compare results directly with those obtained from 2,4-D.

Materials and Methods

All studies were located near Lincoln, Nebraska, in the same pasture as the long-term study of Klingman and McCarty (1958). The study area is a degenerate tall-grass pasture composed primarily of Kentucky bluegrass (*Poa pratensis* L.) and herbaceous weeds such as western ironweed (*Vernonia baldwinii* Torr.), hoary vervain (*Verbena stricta* Vent.), common ragweed (*Ambrosia artemisiifolia* L.), common yarrow (*Achillea millefolium* L.) and western ragweed. Western ragweed in the pasture is an old stand but varies considerably in density across the area. Western ragweed in the study area has been shown to be more tolerant of 2,4-D than most infestations of this species (Bovey et al., 1966). Scattered plants of sideoats grama (*Bouteloua curtipendula* (Michx.) Torr.), big bluestem (*Andropogon gerardii* Vitman), smooth bromegrass (*Bromus inermis* Leyss.) and western wheatgrass (*Agropyron smithii* Rydb.) in the study area were of such low vigor and frequency that they produced little of the total herbage. The study site was located on Pawnee silty clay loam of rolling topography. The pasture was never tilled and was lightly stocked with cattle during these studies.

All experiments were designed as randomized complete blocks with four to six replications. Treatments were applied to 8 by 30 or 10 by 30-ft plots in water at 20 gal/acre. Herbicides, formulations and rates applied were the isopropyl ester of 2,4-D at 1 or 2 lb./acre, the potassium salt of picloram at 0.5, 1 or 2 lb./acre and the dimethylamine salt of dicamba at 1, 2 or 3 lb./acre. Herbicides were applied in mid-June except in one study in 1965 which was treated on May 25. Western ragweed was treated during stem elon-

Table 1. Pretreatment densities (stems/ft²) and reduction (%) in western ragweed stem numbers following application of various rates (lb./acre) of 2–4-D, picloram and dicamba in June 1964 near Lincoln, Nebraska.

Herbicide	Rate	Pre-treatment density	Reduction in live stem numbers[1] 1965	1966	1967
None		27	0	0	0
2,4-D	1	16	0	29	25
2,4-D	2	11	0	58	55
Picloram	0.5	42	0	0	8
Picloram	1	25	64*	29	55
Picloram	2	9	95*	80*	67*
Dicamba	1	22	6	42	32
Dicamba	2	12	75*	29	44
Dicamba	3	20	70*	50	48

[1] Asterisks indicate significant reductions ($P \geqslant .05$) in live stem numbers as compared to original densities.

Table 3. Pretreatment densities (stems/ft²) and reduction (%) in western ragweed stem numbers following applications of various rates (lb./acre) of 2,4-D, picloram and dicamba in May 1965 near Lincoln, Nebraska.

Herbicide	Rate	Pre-treatment density	Reduction in live stem numbers[1] 1965	1966	1967
None		11	0	0	0
2,4-D	1	21	44	0	10
2,4-D	2	23	85*	65*	22
Picloram	0.5	28	100*	70*	0
Picloram	1	21	84*	85*	0
Picloram	2	13	100*	100*	46
Dicamba	1	12	99*	90*	0
Dicamba	2	17	100*	90*	70*
Dicamba	3	34	100*	75*	63*

[1] Asterisks indicate significant reductions ($P \geqslant .05$) in live stem numbers as compared to original densities.

gation in most studies. The effect of a single herbicide application is reported for all experiments except for one established in 1966 and retreated in 1967.

We evaluated treatment effect by counting live western ragweed stems in 2 by 4-ft sampling areas before and after herbicide applications. The sampling areas were permanently located by stretching a chain, marked at specific intervals, diagonally across the plots.

Treatment effect was based on reduction of number of live stems the year of treatment and in subsequent years. Densities following herbicide application were converted to percentage control based on pretreatment counts for presentation in tables.

Results and Discussion

Our observations indicate that in eastern Nebraska, western ragweed usually emerges about the middle of April. It first forms floral buds around the 25th of June. Within another month, the floral buds are fully formed and first blooms begin to appear. Since herbicides are usually more toxic to plants undergoing rapid vegetative growth and maximum emergence is required for effective control, mid-June was chosen as the date for herbicide application to western ragweed. Soil moisture was adequate for rapid vegetative growth of western ragweed during the study period.

Numbers of live western ragweed stems were not reduced in 1965 by application of 1 or 2 lb./acre of 2,4-D in 1964 (Table 1). Number of live western ragweed stems was reduced the season of treatment from both rates of 2,4-D applied in May 1965 (Table 2) and from 2 lb./acre applied in June 1965 (Table 3) or June 1966 (Table 4). The experiment initiated in May 1965 was the only study in which 2 lb./acre of 2,4-D reduced western ragweed density for more than one year.

Table 2. Pretreatment densities (stems/ft²) and reduction (%) in western ragweed stem numbers following applications of various rates (lb./acre) of 2,4-D, picloram and dicamba in May 1965 near Lincoln, Nebraska.

Herbicide	Rate	Pre-treatment density	Reduction in live stem numbers[1] 1965	1966	1967
None		5	0	0	0
2,4-D	1	5	84*	33	6
2,4-D	2	5	100*	80*	60*
Picloram	0.5	8	100*	76*	32
Picloram	1	12	100*	76*	56*
Picloram	2	9	100*	100*	83*
Dicamba	1	8	93*	76*	0
Dicamba	2	8	100*	100*	55*
Dicamba	3	11	100*	100*	66*

[1] Asterisks indicate significant reductions ($P \geqslant .05$) in live stem numbers as compared to original densities.

Table 4. Reduction (%) in number of live western ragweed stems 60 days after application of various herbicides and rates (lb./acre) in 1966, one year after treatment and 60 days after retreatment in 1967 with 2,4-D, picloram or dicamba near Lincoln, Nebraska.

Herbicide	Rate	Reduction in live stem numbers[1] After 60 days	After 1 year	60 days after retreatment
None		0	0	0
2,4-D	1	90*	67*	87*
2,4-D	2	100*	83*	100*
Picloram	0.5	90*	67*	100*
Picloram	1	90*	100*	100*
Picloram	2	100*	100*	100*
Dicamba	1	30	17	100*
Dicamba	2	50	68*	100*
Dicamba	3	90*	100*	100*

[1] Asterisks indicate significant reductions ($P \geqslant .05$) in live stem numbers as compared to original densities.

Effectiveness of dicamba for western ragweed control varied from study to study. In two experiments, dicamba at 1 lb./acre controlled western ragweed the year of treatment and the season following treatment (Tables 2 and 3). In other studies, fewer western ragweed stems were killed (Tables 1 and 4). However, 2 or 3 lb./acre of dicamba often reduced the number of live western ragweed stems by more than 90% the year of application (Tables 2, 3, and 4). In some cases, reductions of 50 to 70% in number of live stems were recorded the second growing season where high rates of dicamba were applied (Tables 2 and 3).

Picloram at 2 lb./acre was effective in reducing the number of live western ragweed stems in all studies. It was the only treatment which reduced western ragweed density for 3 years after a single application (Table 1) and gave 70 to 80% control into the second season in most studies (Tables 2 and 3). One lb./acre of picloram reduced the number of live western ragweed stems by 95 to 100% the year of treatment, but control usually decreased in most studies the year following application (Tables 1, 2 and 3). Picloram at 0.5 lb./acre did not give adequate western ragweed control in studies initiated in 1964. Effective western ragweed control was obtained the year of treatment in studies initiated in 1965 (Tables 2 and 3). All rates of picloram and dicamba, and 2 lb./acre of 2,4-D controlled western ragweed when applied for 2 successive years (Table 4).

These data indicate that western ragweed in the study area will tolerate 1 lb./acre of 2,4-D and that 2 lb./acre occasionally does not give adequate control. This has also been observed in adjacent long-term, weed control studies. Other reports indicated better kills with 2,4-D than we obtained on western ragweed. Picloram at 1 lb./acre gave more uniform results and reliable control of western ragweed than did 2,4-D. Applications of picloram have also been more effective than 2,4-D in controlling other perennial species in the same area (McCarty and Scifres, 1968a and 1968b).

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