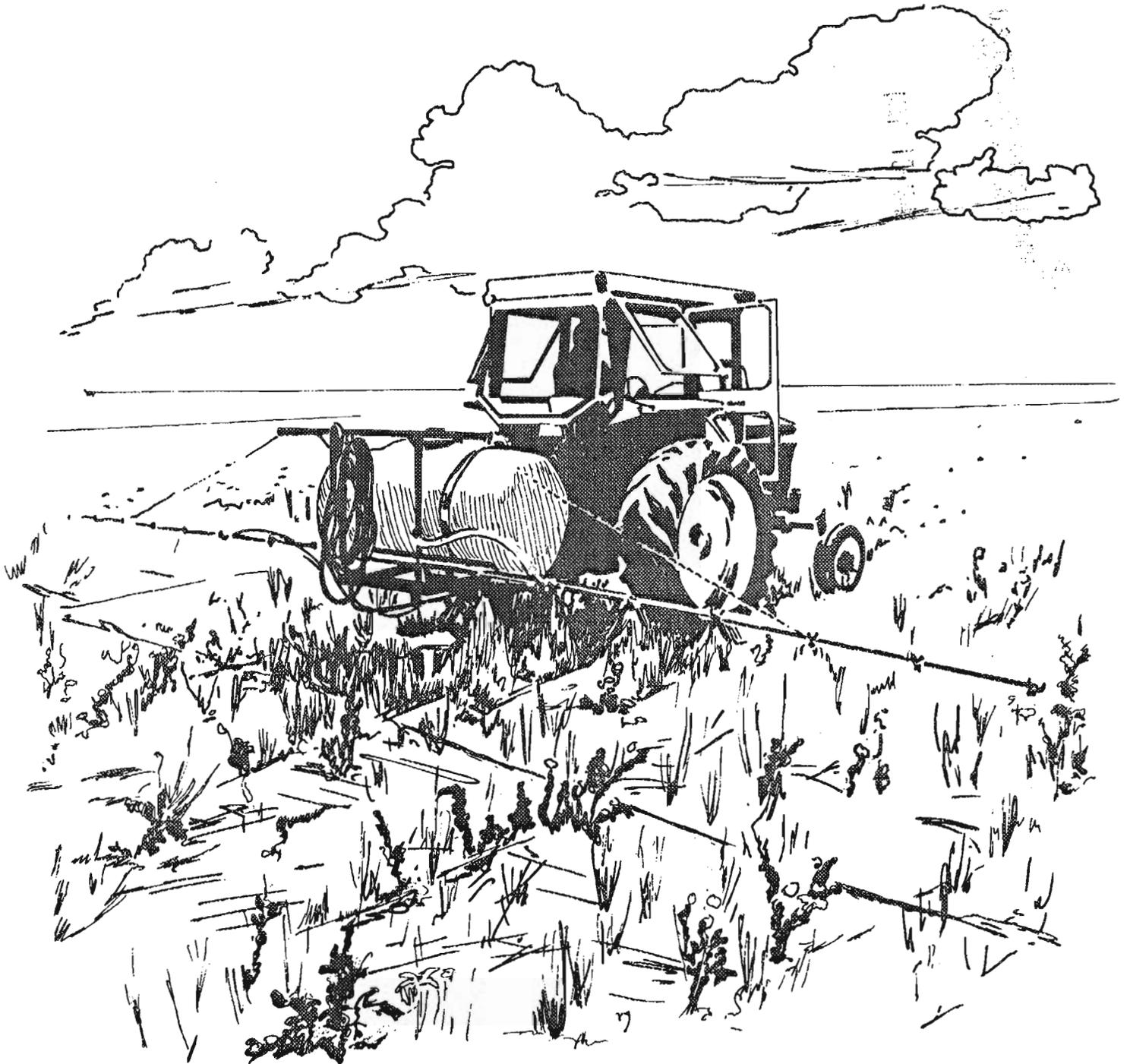


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HERBICIDES FOR CHEMICAL FALLOW IN NORTHEASTERN COLORADO



EXPERIMENT STATION

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**HERBICIDES FOR CHEMICAL
FALLOW IN NORTHEASTERN
COLORADO**

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²Contribution from USDA-ARS.

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Introduction

The practice of alternate winter wheat fallow, begun in the 1930s, allows precipitation from one year to be stored and used for the following year's crop growth. Equipment available in the 1930s consisted primarily of moldboard plows and shallow working disks or harrow implements. Although use of these implements resulted in soil moisture loss, this practice was successful in stabilizing production and increasing yields. As tillage equipment improved, fallow water storage efficiencies increased as did the winter wheat grain yields (Greb, et al.).

By the late 1950s and early 1960s, herbicides began to replace tillage for weed control (Wicks and Smika). The number and reliability of herbicides have continued to increase, and the prospect of complete no-tillage during fallow now is an achievable goal. This study's objective was to determine the suitability of selected herbicides for chemical fallow.

Methods and Materials

Several herbicides at various rates were evaluated during 14-month fallow periods over nine years. The soil of the experimental area is a Weld silt loam with a pH of 7.4 and an organic matter content of 1.3 percent in the surface 6 inches. All plots were 24 feet by 100 feet and replicated three times in a randomized block design. The herbicides were applied in 18 gallons per acre of spray solution with a sprayer equipped with hollow cone nozzles operated at 40 pounds per square inch.

The herbicides tested were Atrazine¹, Bladex, Sencor, Igran, Glean and Banvel. All herbicides were tested alone or in various combinations. In addition to the above listed herbicides, the following are labeled for use in chemical fallow: Roundup, Paraquat, 2,4-D ester and Chem Hoe 135. The first three are non-residual contact herbicides and do not present a carryover problem. Chem Hoe 135 did not receive sufficient evaluation to provide conclusive information on its field performance.

Conventional tillage treatment consisted of sweep plowing as needed to control weeds. Herbicide treatments were applied following wheat harvest in late July of each year. Paraquat at ½ pint

per acre² was tank-mixed with each herbicide to eliminate any existing weeds. The length of weed control was determined visually by recording the date when less than 85 percent of the soil surface was weed-free at which time the plots were resprayed with paraquat at ½ pint per acre and 2,4-D ester at 0.4 pound per acre.

Discussion

The duration of effective weed control (plot area 85 percent weed free) for various rates of the herbicides is shown in table 1. All herbicide treatments that were applied after harvest maintained weed control for over 300 days, ranging from 313 days of weed control by Atrazine + Bladex (0.7 + 1.3 pounds per acre) to 390 days of weed control by Atrazine + Igran (1.0 + 2.0 pounds per acre). Bladex and Igran also can be applied alone in the spring (April) with control lasting for up to 90 days at the 3-pounds-per-acre rate. Glean is a new broadleaf weed herbicide and, if applied before the boot growth stage, can be used post emergent to the winter wheat crop as well as during the fallow season. Glean persistence in the soil is extremely long with ½ ounce per acre controlling broadleaf weeds for 518 days. The duration of weed control for these herbicides can be affected by the amount of precipitation received during the fallow season. The length of control would be longer during drier fallow seasons while years of excess moisture would result in loss of weed control earlier in the fallow season. The range of weed control duration for each herbicide at various rates over the nine years also is shown in table 1.

The activity of several herbicides on specific weed species is shown in table 2. Some weeds appeared to be somewhat tolerant to herbicide control. Igran did not control downy brome consistently while Glean had no effect on any grasses. Tansy mustard appeared in Igran and Glean treated areas to a limited extent while skeletonweed became prominent in Atrazine, Sencor/Lexone and Bladex treated areas. Bladex and Sencor/Lexone did not always control Russian thistle adequately, and common purslane was controlled only partially by Glean.

Several possible chemical fallow programs demonstrate the flexibility that exists with the presently available herbicides (figure 1). Program 1, Atrazine + Igran at 1.0 + 2.0 pounds per acre, would be expected to control weeds for 390 days, or from July 15 of one year to Aug. 9 of the fol-

¹Trade names are used solely to provide specific information. Mention of a trade name does not constitute a guarantee or endorsement by the U.S. Department of Agriculture.

²The rate of herbicide is expressed as active ingredient.

Table 1. Effective length of weed control when herbicides were applied for chemical fallow after wheat harvest.

Herbicide	Application date	Formulation	Application rate (lbs ai/ac)	Expected control duration (days)
Atrazine	July	4L, 80W or Nine-0	0.8	329 ± 30
			1.0	353 ± 33
			1.25	359 ± 31
Sencor/Lexone	July	4L, 75DF or 50WP	0.5	340 ± 30
			0.75	359 ± 30
Bladex	July	80W	2.0	317 ± 18
			3.0	345 ± 10
			April	2.0
	April	2.5	70 ± 30	
		3.0	80 ± 20	
Igran	July	80W	2.0	345 ± 20
			3.0	365 ± 10
	April	2.0	75 ± 17	
		2.5	82 ± 21	
		3.0	90 ± 15	
Atrazine + Bladex	July	2	0.7 + 1.3	313 ± 32
			0.75 + 3.0	351 ± 36
			1.0 + 2.0	376 ± 32
Atrazine + Igran	July	2	.75 + 2.5	380 ± 14
			1.0 + 2.0	390 ± 15
Atrazine + Sencor	July	2	0.5 + 0.4	332 ± 48
			0.5 + 0.5	346 ± 56
			0.75 + 0.75	348 ± 50
Glean	1	75DF	1/8 oz/ac	300 ± 15
			1/4 oz/ac	365 ± 15
			1/3 oz/ac	425 ± 20
			1/2 oz/ac	518 ± 30

¹Applied to growing wheat prior to boot growth stage.

²Same formulations as when used alone.

lowing year. If such weeds as redroot pigweed, foxtail and common purslane emerge after Atrazine has lost its effectiveness, an application of Paraquat + 2,4-D at ½ pint per acre + 0.4 pound per acre would eliminate the weed growth without any residual activity injuring the following winter wheat crop.

In program 2, Atrazine alone at 1.0 pound per acre would control weeds for 353 days, July 15 to July 3 of the following year. With this program, the Roundup + Banvel treatment may need to be applied twice, in early July and early August, to insure weed-free conditions until planting in September.

Glean at ¼ ounce per acre + Atrazine at 0.6 pound per acre, a third program, maintains weed control for 365 days. If new weed growth occurs in July, Roundup + Banvel can be applied and Paraquat + 2,4-D sprayed in late August to eliminate any late season weed growth. By using the Paraquat + 2,4-D combination after Aug. 15, no herbi-

cide residue damage occurs to the planted winter wheat because the herbicides' residual activity is short (less than a week). Roundup + Banvel may persist for four to six weeks; thus, these herbicides would injure winter wheat if sprayed in late August.

A fourth program involves spraying Igran at 3.0 pounds per acre in April to control weeds for 90 days, followed by two applications of Roundup + Banvel to maintain weed control until September. This program would be feasible only if volunteer wheat and downy brome were not a severe problem in the fall after harvest.

If the weed spectrum of a particular field is known, the application of herbicides could be timed to achieve optimal weed control. For example, if downy brome is prevalent, the spring applications of Igran or Bladex would be unsuitable since downy brome usually emerges in the fall, but Atrazine applied after wheat harvest would control the fall growth of downy brome. Also, if farmers

plan to use Atrazine, they should consult "CSU Technical Bulletin 144: Atrazine Carryover and its Soil Factor Relationships" to determine if such soil factors as pH or percent-clay-content of a particular field indicate a high possibility of Atrazine carryover. If this carryover possibility exists, farmers may select another herbicide such as Igran, Bladex

or Glean to insure weed control over the fallow season.

In addition to the four herbicidal combinations, other herbicides also are suitable for chemical fallow. Thus, several possible combinations could be used to control weeds without herbicidal carryover damaging winter wheat.

Table 2. Relative control of various weeds by herbicides applied to chemical fallow. Observations were made over the nine-year period of this study.¹

Weed Species		Atrazine	Sencor/Lexone	Bladex	Igran	Glean
Grassy weeds						
Volunteer wheat	(<i>Triticum aestivum</i>)	S	S	S	S	N
Downy brome	(<i>Bromus tectorum</i>)	S	S	S	E	N
Foxtails	(<i>Setaria spp.</i>)	S	S	S	S	N
Broadleaf weeds						
Tansy mustard	(<i>Descurainia pinnata</i>)	S	S	S	E	E
Blue mustard	(<i>Chorispora tenella</i>)	S	S	S	S	S
Wild mustard	(<i>Brassica kaber</i>)	S	S	S	S	S
Prickly lettuce	(<i>Lactuca scariola</i>)	S	S	-	S	S
Common Sunflower	(<i>Helianthus annuus</i>)	S	-	S	-	S
Kochia	(<i>Kochia scoparis</i>)	S	S	S	S	S
Lambsquarters	(<i>Chenopodium album</i>)	S	S	S	S	S
Russian thistle	(<i>Salsola kali</i>)	S	E	E	S	S
Skeleton weed	(<i>Lygodesmia juncea</i>)	E	E	E	-	-
Redroot pigweed	(<i>Amaranthus retroflexus</i>)	S	S	S	S	S
Common Purslane	(<i>Portulaca oleracea</i>)	S	S	S	S	E

¹The letter S designates satisfactory herbicidal control of indicated species.

The letter E designates erratic herbicidal control of indicated species.

The letter N designates no herbicidal control of indicated species.

A dash line indicates lack of sufficient data to determine herbicide performance.

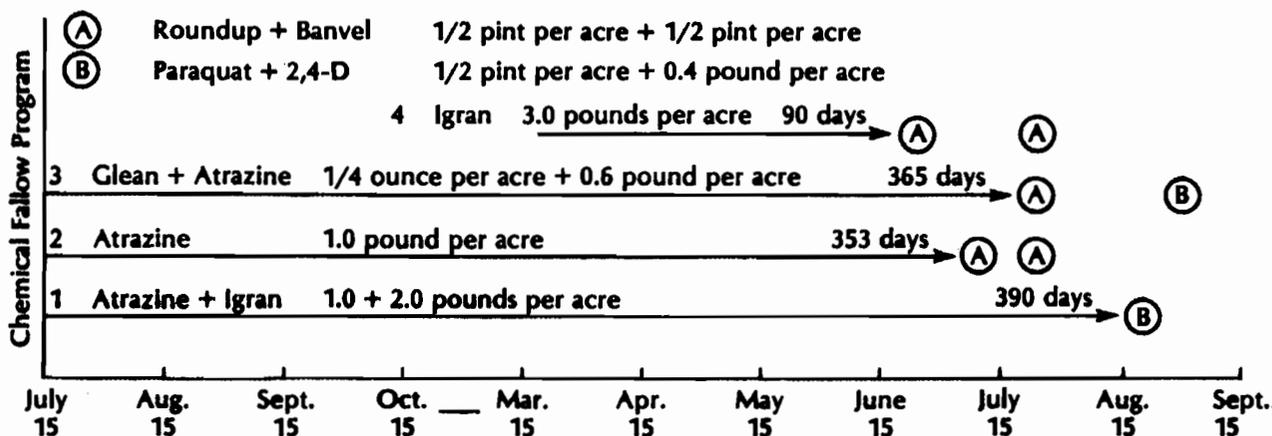


Figure 1. Possible chemical fallow programs for northeastern Colorado.

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