WILD OAT (Avena fatus L.) CONTROL WITH TRIALLATE (FAR-GO) IN WHEAT

P.K. Fay, J.D. Nalewaja and S.D. Miller

Wild oat (Avena fatua L.) causes yield losses and additional production costs estimated at over $1.5 billion per year in the northern United States and adjoining Canadian provinces. North Dakota has the greatest wild oat infestation in the United States and has annual losses from wild oat estimated between $150 and $250 million (3).

INTRODUCTION

Wild oat is a vigorous competitor with wheat *(Triticum aestivum L.)*. Bell and Nalewaja (2) reported in 1968 that a wild oat density of only 10 seedlings per sq yd caused wheat yield losses of 1 to 3 bu/A. Populations of 70 and 100 wild oat seedlings per sq yd reduced wheat yields 22 per cent and 39 per cent, respectively, compared to wheat free of wild oat. Wild oat densities of 70 to 100 plants per sq yd are very common across the state (6), thus wild oat control is a major concern of small grain farmers in North Dakota. Extreme infestations of over 1,000 wild oat plants per square foot have been observed.

Triallate [(S-(2,3,3-trichloroallyl)diisopropylthiocarbamate], sold under the trade name Fargo, is an effective wild oat herbicide under normal environmental conditions. Spring treatments of triallate must be applied and incorporated soon after planting wheat. Triallate is applied to a relatively small amount of acreage in the spring because soil incorporation requires extra work during a busy time of the year.

Research conducted in 1964 and 1965 at North Dakota State University indicated that liquid formulations of triallate applied in the fall gave effective wild oat control when soil incorporated. Friesen (4) has found that triallate granules were more effective than liquid triallate for fall applications on stubble land. He noted that triallate granules applied to stubble in the fall and not incorporated gave excellent wild oat control the following season. The incorporation of triallate into soil increases the erosion problem associated with fall tilled, clean soil surfaces. The granular formulation of triallate may control wild oat effectively with minimal incorporation on fields with heavy plant residue on the surface.

The objectives of the research reported here were to determine the effectiveness of fall triallate applications using the liquid and granular formulations and the influence of soil incorporation upon the effectiveness of these formulations.

Dr. Fay is research associate, Dr. Nalewaja is professor, and Dr. Miller is assistant professor, Department of Agronomy.

METHODS AND MATERIALS

Comparison of fall and spring applications of triallate

The following experiment was conducted five times from the fall of 1969 through the summer of 1974 at Fargo. The liquid formulation of triallate was applied in the fall after October 15 or the following spring after planting at a rate of 1 lb/A on soil previously plowed, disced and harrowed in September. The herbicide was applied with a bicycle-type sprayer in 17 gallons/acre at 35 lbs/sq. in. on 10 x 25-foot plots, and incorporated two times with a spiked tooth harrow in 1969 and 1970, or with a field cultivator in 1971 through 1974. In the four replications in the spring of each year, the soil was tandem disced and harrowed before the wheat was planted. Wild oat control was rated about July 15 as a per cent of the untreated plots in each season.

Time of fall application

The liquid formulation of triallate was applied in the manner described above during either early or late fall in 1964 and 1965 at 1 lb/A. The dates of application were October 1 and October 30, 1964, and October 12 and November 8, 1965.

Granular triallate

This experiment was conducted annually for five years. Fall applications of triallate at 1 and 1.5 lb/A were applied after October 15 each year. The liquid formulation was applied as above and the 10 per cent (active ingredient) granules were applied with a Gandy Turf Tender granular applicator. The herbicide was incorporated twice with a spike-tooth harrow in 1969 and 1970, and with a field cultivator in 1971 through 1974. The experiment was arranged in a split-plot design with four replications.

Surface applied versus incorporated triallate

Liquid and granular triallate formulations at 1 lb/A and 1.5 lb/A were applied as above with or

Table 1. Mean wheat yield and wild oat control from spring and fall applications of triallate at Fargo from 1969 to 1974.

Time of application	% Wild oat control	Wheat yield Bu/A
Fall	76 a[1]	23.7 a[2]
Spring	74 a	22.0 a
Control	0 b	15.1 b

[1]means followed by the same letter do not differ at the .05 level according to the LSD test.

[2]each value is the mean of five experiments conducted over a 5-year period.

without incorporation in late fall or after crop planting in the spring. This experiment also was conducted annually over a five-year period.

Effect of soil surface condition

The effect of incorporated versus not incorporated fall applied triallate granules was compared on trashy and clean soil surfaces. The clean surface was summer fallow; the trashy surface was prepared from stubble. Both sites were field cultivated in September, 1973. Triallate granules were applied as above with and without incorporation by a field cultivator on October 23, 1973.

RESULTS

Comparison of fall and spring applications

Triallate liquid gave slightly better wild oat control when applied in the fall (Table 1). The trend over five years was for an approximate 2 bu/A increase over spring applied triallate in wheat yield indicating that fall treatment is an acceptable method for wild oat control the following season.

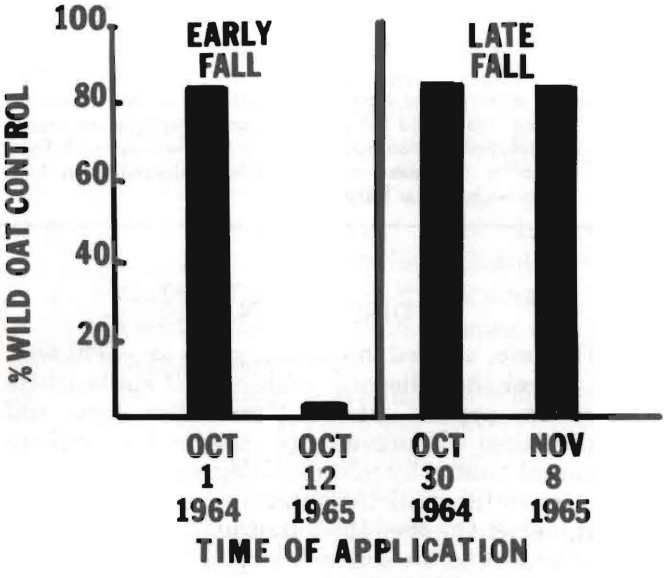

Figure 1. The effect of early and late fall triallate applications (1 lb/A) on wild oat control the following season.

Time of fall application

Triallate liquid gave excellent wild oat control when applied late in the fall (Figure 1). The early fall treatment in 1964 gave excellent control, but the early treatment in 1965 gave virtually no control. Erratic results for early fall applications were observed in subsequent years; therefore, effective wild oat control may be expected if the herbicide is applied after October 15 in North Dakota.

Triallate granules

Granules gave excellent wild oat control when applied in late fall or spring (Figure 2). Late fall applications of granules gave about 10 per cent better control than the liquid formulation; however, there was no difference in wheat yield. The five-year yield average for both formulations applied in the fall at 1 lb/A was 23 bushels per acre. The untreated control yield was 15 bu/A. There was no difference in wild oat control between the two formulations when applied in the spring.

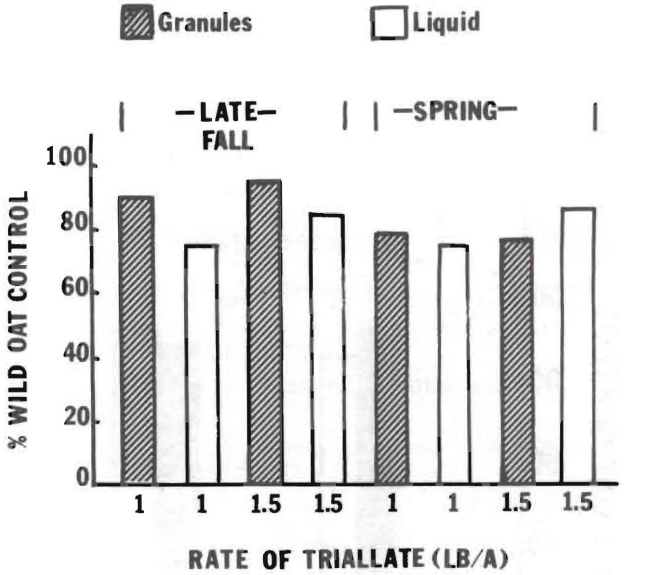

Figure 2. A comparison of triallate granules and liquid formulations applied in late fall or early spring after wheat planting. Each bar is the mean of five trials conducted over a 5-year period at Fargo.

Surface applied versus incorporated triallate

Incorporation of triallate increased control in all treatments; however, the late fall granular treatment gave excellent wild oat control without incorporation (Figure 4). Wild oat control decreased

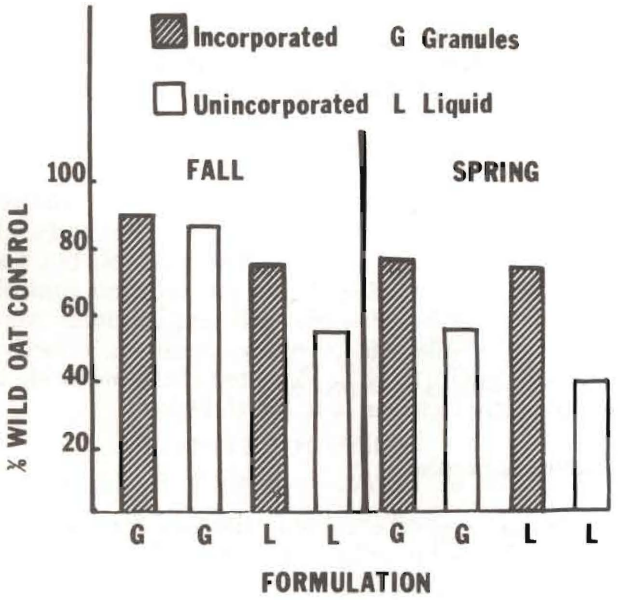

Figure 3. Comparison of incorporated and unincorporated triallate (1 lb/A) in a granular and liquid formulation. Each bar is the mean of five trials over a 5-year period.

25 to 35 per cent with liquid triallate if incorporation was eliminated. A similar decrease in control occurred when triallate granules were applied without incorporation in the spring.

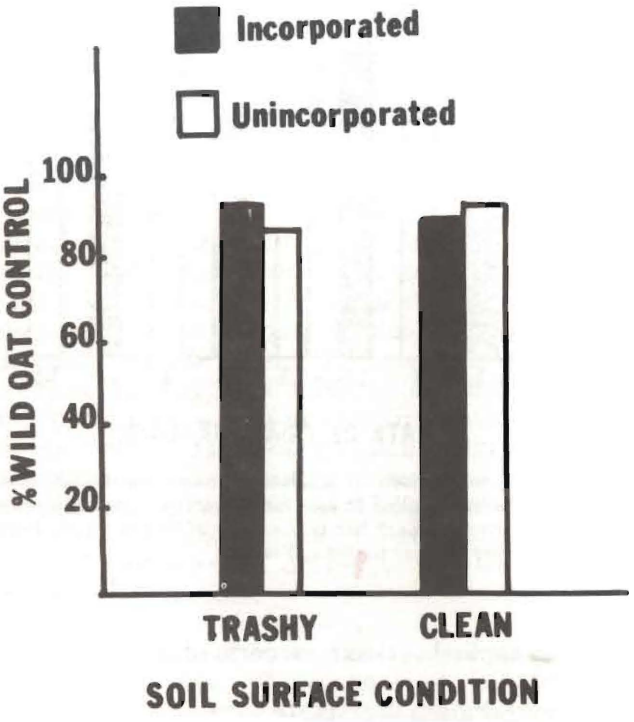

Figure 4. Wild oat control following late fall granular triallate applications (1 lb/A) on two soil surfaces.

Effect of soil surface condition

The condition of the soil surface at the time of application of triallate granules did not affect the wild oat control (Figure 5). Therefore, in those areas where stubble mulching is practiced for erosion control, fall application of triallate granules could be used for wild oat control since a clean soil surface is not a necessity.

Effect of triallate rate on wheat yield

Triallate granules at 1.5 lb/A caused wheat injury when fall applied, but did not cause injury when spring applied. The liquid formulation did not injure wheat at either rate. In general, triallate at 1.5 lb/A gave better wild oat control, but the increased control was not reflected in the yield of wheat (Figure 3). Apparently, 1 lb/A was the optimal rate of triallate for wild oat control regardless of formulation or time of application in these experiments.

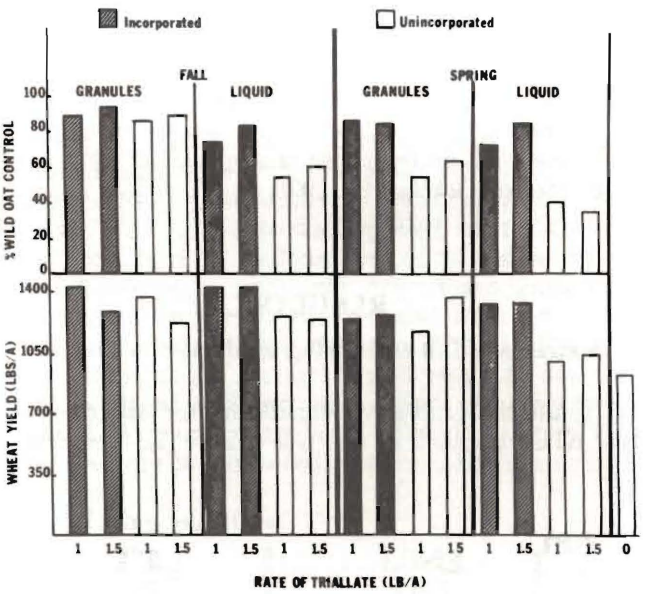

Figure 5. Comparison of time of application of triallate granules and liquid, and the effect of surface application versus incorporation on wild oat control and wheat yield. Each bar is the mean of five trials conducted from 1969 through 1974 at Fargo.

DISCUSSION

Triallate, applied in the fall, gives excellent wild oat control the following season. Fall applications must be applied at a time when low soil temperatures will prevail since the level of triallate is reduced rapidly by microbial degradation in warm moist soils (8). Soil temperatures are usually low enough after October 15 so that little or no triallate would be lost before soil freeze-up in North Dakota.

Spring and fall applied triallate granules gave excellent results; however, wild oat control was

slightly better with late fall than spring applications. The effectiveness of fall applied triallate may be from uniform distribution of triallate in the soil from diffusion and fall incorporation plus spring tillage.

Excellent wild oat control was obtained from nonincorporated triallate granules applied in the fall; however, under farm conditions, wild oat control with nonincorporated granules probably would be inconsistent. Triallate is incorporated to reduce loss by volatilization (8), and volatilization losses are reduced at low temperatures (5). If abnormally warm temperatures occurred after application either in the fall or in the spring before planting, significant triallate losses could occur resulting in decreased wild oat control. The use of granules would reduce the amount of incorporation necessary in most situations and ensure effective wild oat control over a wide range of environments.

Triallate granules are adaptable to spot treatment of wild oat problem areas within a given field. One method of application would be to mount a granular applicator in front of the shanks of a field cultivator. The granules could be applied and incorporated in one operation either as a special spot treatment or as a part of a fall tillage. The application of triallate granules requires a special applicator. This is usually not a problem, since most agricultural chemical dealers rent or loan the necessary equipment to farmers.

Triallate granules are applicable to a variety of soil surface conditions in the fall, while a clean soil surface is required for application and incorporation of liquid triallate. The adaptability of triallate granules to trashy soil surfaces makes them especially useful in areas where a trashy surface should be left over the winter to prevent wind erosion.

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