USE OF TRIFLURALIN FOR SOWINGS OF SIBERIAN ELM

L. K. Alspach and M. R. Carter[1]

Investigations Section, PFRA Tree Nursery,
Indian Head, Sask., Can.

The Siberian elm (*Ulmus pumila* L.) has shown promise for shelterbelt plantings in the prairies by demonstrating rapid growth, drought tolerance, and relative salt tolerance. However, large-scale production of Siberian elm, as with other trees, is economically dependent on successful control of weeds. In agriculture, trifluralin (Treflan) has been used extensively as a preplant or preemergence, soil-incorporated treatment to control most grass and many broad-leaved weeds as they germinate. This paper is a summary of several years research into the use of trifluralin for control of weeds in seedlings of Siberian elm (fig. 1).

Methods

Screening tests were carried out in a greenhouse to determine the tolerance of Siberian elm sowings to trifluralin (4 EC) applied at five different rates (0.0,1.1,1.7, 2.2, and 2.8 kg/ha) and on four different dates (0, 3, 6, and 9 days) prior to sowing. Siberian elm seeds were sown in flats (30- by 60- by 10-cm) in a 2:1 clay loam and sand media. Each flat comprised one application rate and contained four rows of seeds (25 seeds per row), one row for each sowing date. Tests were arranged in a randomized block design with four replicates. Temperature was maintained between 21° and 26° C, and photoperiods were extended to 14 hours with artificial light. Trifluralin was applied at five rates using a precision greenhouse sprayer and incorporated to a depth of 5 centimeters. Pressure and water volume were 207 kPa and 1670 l/ha, respectively. Survival of Siberian elm seedlings was recorded 56 days after sowing.

Figure 1.—*Weed control in Siberian elm sowings with trilluralin.*

To supplement the greenhouse studies, several field experiments were carried out to determine the optimum rate and time of incorporation of trifluralin before sowing of Siberian elm. Assessment was also made of the effect of trifluralin on weed control and on the growth and survival of Siberian elm seedlings. Field experiments were arranged in a randomized block design with five or six replicates (3.0 by 1.5 m plots) on a Black Chernozemic clay loam soil (2 to 5 percent organic matter, 30 percent clay). Trifluralin was applied using a precision plot sprayer at a spray pressure of 138 kPa and a spray volume of 540 l/ha. Immediately after application, the herbicide was incorporated to a 5- to 7.5-centimeter depth using a hand rotovator. Siberian elm seed was sown 0.6 centimeters deep during the last 2 weeks of June and irrigated immediately. Weed data was taken within 1 to 2 months of sowing, while tree survival and growth was observed in the fall. The main weed species present were purslane, shepherd's purse, prostrate pigweed, and redroot pigweed.

For the purpose of this paper, two field experiments were selected from a series to summarize 6 years of research. The first experiment tested four rates of trifluralin (0.0, 0.56,1.1, and 1.7 kg/ha), applied and incorporated 0, 7, and 17 days before the sowing of Siberian elm. The second experiment, in response to the first, evaluated five rates of trifluralin (0.0, 0.8,1.1,1.7, and 2.2 kg/ha), applied and incorporated 7 days before sowing. Siberian elm was sown in three rows per plot at 300 seeds per row, and one row per plot at 200 seeds per row in the first and second experiments, respectively.

Results

Results from the greenhouse screening test indicated that survival was adversely affected by all trifluralin treatments applied

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immediately before sowing (table 1). Only the two highest rates (2.2 and 2.8 kg/ha) reduced survival when sowing was delayed by 3 to 6 days after application. Application of trifluralin 9 days before sowing had no adverse affect on the survival of Siberian elm.

The first field experiment provided similar results (table 2) to those of the greenhouse screening test. Trifluralin adversely affected survival when applied immediately before sowing, except in the case of the very low rate (0.56 kg/ha). Application 7 days before sowing provided good weed control and acceptable survival of Siberian elm. Reduced weed control at the 0.56 to 1.10 kg/ha rate for the 17-day treatment was possibly because of poor moisture conditions recorded at the time of application.

The second field experiment, with applications 7 days before sowing, was designed to determine an optimum rate of trifluralin. The results indicated that 1.1, 1.7, and 2.2 kg/ha of trifluralin adversely affected top growth of Siberian elm, while the latter rate also reduced survival (table 3). Trifluralin at 0.8 kg/ha gave good weed control and showed no significant ($P<0.05$) decrease in the growth or survival of Siberian elm.

Some persistence of trifluralin in the soil has been evident on the Canadian prairies. Studies have indicated that more than one growing season may be required before trifluralin levels decrease to a nonphytotoxic level.[2] Still, Siberian elm is usually a 2-year crop, thus some persistence of trifluralin would be desirable.

Table 1.—*Survival of Siberian elm seedlings to varying time of application and rates of trifluralin in the greenhouse*

Rate of trifluralin kg/ha	Survival (percent of seed sown) [1]			
	Time of application before sowing (in days)			
	0	3	6	9
0	91a	86a	91a	88a
1.1	72b	76ab	81a	80a
1.7	52c	72ab	83a	84a
2.2	37cd	62bc	68b	82a
2.8	25d	49c	51e	75a

[1]Means within columns followed by the same letter(s) are not significantly different at the 5-percent level according to Duncan's multiple range test.

Table 2.—*Survival of Siberian elm seedlings and weed control at varying time of application and rates of trifluralin in the field*

Rate of trifluralin kg/ha	Time of application before sowing (in days)	Survival[1] (percent of seed sown)	Weed control[2] (0-9)
0 Check not weeded	—	18abc	0
0 Check weeded	—	19abc	—
0.56	0	14bcd	8
	7	21abc	7
	17	24a	2++
1.10	0	5d	9
	7	12cd	8
	17	22ab	4+
1.70	0	6d	9
	7	16abc	9
	17	20abc	7

[1]Means followed by the same letters are not significantly different at the 5-percent level according to Duncan's multiple range test.

[2]Weed control 0-no control, 9-complete control.

+, ++Significantly less than for best weed control at 5 and 1 percent, respectively.

[2]Rahman, A. and Ashford, R. 1973. Persistence of trifluralin under field conditions in Saskatchewan. Can. J. Plant Sci. 53:421-423.

Table 3.—*Survival and top growth of Siberian elm and weed control at four rates of trifluralin applied 7 days before sowing in the field.*

Rate of trifluralin kg/ha		Survival[1] (percent of seed sown)	Top growth[1] (g)	Weed control[2] (0-9)
0	Check not weeded	43a	6.0c	0.0
0	Check weeded	44a	8.6a	—
0.8		37ab	8.1ab	7.2
1.1		33ab	7.9b	7.6
1.7		33ab	6.5c	7.2
2.2		25b	6.1c	7.8

[1]Means followed by the same letters are not significantly different at the 5-percent level according to Duncan's multiple range test.

[2]Weed control 0—no control, 9—complete control.