Control of Aspen and Prickly Rose in Recently Developed Pastures in Saskatchewan

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Highlight: *Two consecutive yearly applications of 2,4-D and 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre gave good control of aspen (*Populus tremuloides *Michx.) for 5 years in Saskatchewan. There was virtually no regeneration of new shoots from parental root stocks by the third year after the initial treatment. Control of prickly rose (*Rosa acicularis *Lindl.) was erratic with 2,4-D plus 2,4,5-T at 2 lb/acre, but the mixture was needed when both woody plants were present.*

Aspen (*Populus tremuloides* Michx.) is the dominant species in the aspen parkland in Saskatchewan. The parkland buffers the prairie to the south and the coniferous forest to the north. During the last 5 years, an average of 16 to 20,000 acres per annum in the aspen parkland were cleared of trees and are now being used for the grazing of cattle. Aspen poplar can reproduce vegetatively by root suckering, collar or basal sprouting, and stump (above root collar) sprouting. The rate of regeneration increases following a disturbance. The method commonly used for tree removal, i.e., bulldozing, piling, and burning of brush, leaves sufficient roots in the soil to permit rapid re-establishment of the plant. Aspen has some forage value, but when it reaches the mature stage and develops a closed canopy there is at least a three-fold reduction of forage (Johnston and Smoliak, 1968). Prickly rose (*Rosa acicularis* Lindl.) is another species which is very prevalent in areas recently converted from parkland. It occurs mainly on the drier sites.

Present recommendations indicate that prickly rose and aspen can be controlled with 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre and 2,4-D at 2 lb/acre, respectively. However, there is little information on the length of time that control can be expected after herbicide application. Two tests were conducted from 1967 to 1970 to evaluate combinations of herbicides for long-term control of aspen and prickly rose.

Methods and Materials

The experimental site was located 120 miles northeast of Regina, Sask., on section 15, township 28, range 9, west of the 2nd meridian. Soil was classed as a Waitville loam (Mitchell et al., 1944). The average precipitation recorded at the nearest weather station 25 miles away was 17 inches with 11 inches occurring during the growing season (Anonymous, 1972). A solid stand of aspen was bulldozed and piled during the winter of 1964-65. The area was disced twice with a heavy duty serrated disc drawn by a crawler-tractor and was seeded with a double disc drill to a mixture of alfalfa (*Medicago sativa* L.) and bromegrass (*Bromus inermis* Leyss.) during the summer of 1965. This resulted in a satisfactory stand of forage, but discing did not kill all of the roots so both aspen and prickly rose were rapidly re-establishing in the area at the time of herbicide application. The area was grazed during 1966 but not between 1967 and 1972.

Both the 1967 and 1969 tests were designed as randomized complete blocks and were replicated five times. All plots were 6.4 × 9.1 m in size. Untreated check plots were included in all tests. Evaluation of weed control was accomplished by counting the number of live shoots in the plots before herbicide treatment and the number surviving after herbicide application. Results were expressed as percentage decrease in the number of live stems. Six permanent quadrats each 1.5 × 4.0 m were located in each plot in the 1967 test and three quadrats each 1.5 × 6.0 m were similarly located in the 1969 test. The number of new aspen shoots that emerged from below ground during 1968 and 1969 in the 1967 test were recorded for each of the permanent quadrats. These were included in the estimates of aspen shoots surviving herbicide treatment. Final evaluation of both tests was made in 1972 by estimating the percentage of aspen and prickly rose canopy cover on each plot. Cover for each plot was estimated according to the classification system adapted by Trepp and quoted in Brown (1954). The cover classes were as follows: up to 1.0%, 1.0 to 9.9%, 10.0 to 24.9%, 25.0 to 49.9%, 50.0 to 74.9%, and 75.0 to 100.0%. The mid-points of the classes for the replicates were averaged for each herbicide treatment. Several extreme values in the data make the standard statistical procedures difficult to apply. Furthermore, meaningful conclusions are apparent from the results without resorting to specific tests. Hence, statistical procedures are not discussed.

All herbicides were applied during the optimum time for spraying aspen as soon as possible after full leaf expansion (Friesen et al., 1965). The dates were June 7, 1967; June 9, 1968; and June 19, 1969, for the first test and June 17, 1969, for the second test.

Herbicides and rates used were the butyl esters of 2,4-D (2,4-dichlorophenoxyacetic acid) at 2 lb/acre, the iso-octyl ester of 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) at 0.6 lb/acre, a mixture of the iso-octyl ester of 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre, and a mixture of the butyl esters of 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre. All herbicides were applied in water at 6 gpa with a small compressed air knapsack sprayer in

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Table 1. Pretreatment densities, reduction of aspen shoots and canopy cover following applications of herbicides in 1967 and 1968 or 1969.

Treatment	Application rate (lb/acre)	Year sprayed	Density 1967 (shoots/m²)	Decrease in live stem numbers (%) 1968	1969	1970	Cover 1972 (%)
1. check			1.3	9	10	29	33.5
2. butyl esters of 2,4-D	2.0	1967	1.9	75			
followed by iso-octyl ester of 2,4-D + 2,4,5-T (2:1)	2.0	1968			99	95	0.3
3. butyl esters of 2,4-D	2.0	1967	1.6	79			
followed by iso-octyl esters of 2,4,5-T	0.6	1968			96	90	0.4
4. butyl esters of 2,4-D	2.0	1967	1.4	69	72		
followed by iso-octyl ester of 2,4-D + 2,4,5-T	2.0	1969				80	0.5
5. butyl esters of 2,4-D	2.0	1967	1.7	77	76		
followed by iso-octyl ester of 2,4,5-T	0.6	1969				79	3.5

wind speeds of less than 15 mph which did not appear to affect the results.

Results

When the study was initiated in 1967, the density of aspen ranged from 1.3 to 1.9 shoots/m² (Table 1). A relatively uniform stand of aspen regrowth was present because disc and bulldozer operations had spread pieces of root throughout the area.

Aspen shoot density declined from 1.3 shoots/m² in 1967 to 1.2 shoots/m² in 1969. Of the shoots alive in 1969, only 1.0 shoots/m² had been present in 1967. By 1969, there had been a reduction of 33% in the original population due to causes other than herbicides.

The initial application of 2,4-D at 2 lb/acre gave a 69 to 79% reduction in the population of aspen shoots 1 year after treatment (Table 1). A further reduction in the shoot number was obtained when phenoxy herbicides were applied in a subsequent year. Herbicide applications on 2 consecutive years gave more than 90% control but delaying retreatment for 2 years gave only 80% control. However, 5 years after the start of the test, the canopy cover was much lower on all of the herbicide-treated plots than on the untreated plots.

The density of prickly rose was reasonably uniform on each of the treated plots (Table 2) but the range for any permanent quadrat was from 0.3 to 13.5 shoots/m². There was a natural increase in the population of prickly rose of 56% from 1967 to 1969.

Although there was a greater reduction in the number of aspen shoots with 2,4-D than with mixtures containing 2,4-D and 2,4,5-T, the small differences between the means indicated that 2,4-D was not vastly superior to the mixtures (Table 3). However, regardless of the chemical treatment applied there was excellent reduction of aspen cover 3 years after application.

Discussion

Most of the aspen regrowth occurs immediately after a disturbance but there is usually some regeneration each succeeding year (Strothmann and Zasada, 1962). The high mortality of shoots that grew following tree removal in the check plots (Tables 1 and 4) agreed with the results of Bailey (1972), Horton and Maini (1964), and Pringle et al. (1973).

More of the aspen shoots growing in the area after the original stand had been disturbed were observed to come from underground roots than from seed. These shoots depend on the parent roots for sustenance for at least the first year of growth (Horton and Maini, 1964). Theoretically, repeated

Table 2. Pretreatment densities, reduction of prickly rose shoots and canopy cover following applications of herbicides in 1967 and 1968 or 1969.

Treatment	Application rate (lb/acre)	Year sprayed	Density 1967 (shoots/m²)	Decrease in live stem numbers (%) 1969	1970	Cover 1972 (%)
1. check			4.6	-56*	0	10.3
2. butyl esters of 2,4-D	2.0	1967	5.1			
followed by iso-octyl esters of 2,4-D + 2,4,5-T (2:1)	2.0	1968		95	32	8.9
3. butyl ester of 2,4-D	2.0	1967	4.5			
followed by iso-octyl ester of 2,4,5-T	0.6	1968		98	15	9.3
4. butyl esters of 2,4-D	2.0	1967	4.5			
followed by iso-octyl ester of 2,4-D + 2,4,5-T (2:1)	2.0	1969			29	15.3
5. butyl esters of 2,4-D	2.0	1967	4.6			
followed by iso-octyl ester of 2,4,5-T	0.6	1969			72	9.2

*There was a 56% increase in the number of prickly rose stems from 1967 to 1969.

Table 3. Pretreatment densities, reduction of aspen shoots, and canopy cover following the application of herbicides in 1969.

Treatment	Application rate (lb/acre)	Density 1969 shoots/m²	Decrease in live stem numbers 1970 (%)	Cover 1972 (%)
1. check		1.5	35	14.5
2. butyl esters of 2,4-D	2.0	1.2	80	1.3
3. butyl esters of 2,4-D + 2,4,5-T (2:1)	2.0	1.1	62	0.3
4. iso-octyl esters of 2,4-D + 2,4,5-T (2:1)	2.0	1.2	74	1.4
5. Iso-octyl ester of 2,4-D + 2,4,5-T (1:1)	2.0	1.2	66	3.5

Table 4. The number of new aspen shoots produced (per 100 m²) following herbicide application.

Treatments	Rate (lb/acre)	Year sprayed	Number of aspen shoots produced during the year	
			1967	1968
1. check			7	25
2. butyl esters of 2,4-D	2.0	1967	2	
iso-octyl ester of 2,4-D + 2,4,5-T	2.0	1968		1
3. butyl esters of 2,4-D	2.0	1967	1	
iso-octyl ester of 2,4,5-T	0.6	1968		1
4. butyl esters of 2,4-D	2.0	1967	2	7
5. butyl esters of 2,4-D	2.0	1967	2	7

removal of aspen shoots should kill the plant by exhausting the supply of nutrient reserves. The majority of the aspen shoots were produced the year after the seeding, when according to Horton and Maini (1964) the nutrient reserves were obtained from the parent root. Herbicides were applied the second year after the forage was seeded. Applications of phenoxy herbicides on 2 consecutive years gave satisfactory control of aspen shoots. In the 1967 test, the number of aspen shoots emerging from below ground after the first herbicide treatment (1967) was similar in the treated and untreated plots (Table 4). However, two consecutive phenoxy herbicide treatments greatly reduced shoot emergency compared to plots that received a single application of 2,4-D at 2 lb/acre. Measurements were not recorded after the application of 2,4,5-T or of 2,4-D plus 2,4,5-T in 1969 so the effect of two herbicide treatments applied every other year for the reduction of new aspen shoots is not known. However, consecutive yearly application of phenoxy herbicides was more effective than a single treatment for reducing the number of new aspen shoots.

Prickly rose was controlled by 2,4-D plus 2,4,5-T the year following treatment, but 2 years after treatment the shrub had recovered (Table 2). Most of the shoots originated from root stocks that had survived chemical treatment. No explanation is offered for the superior prickly rose kill with the 1968 as compared to the 1969 chemical application.

When prickly rose is growing in association with aspen then a mixture of 2,4-D plus 2,4,5-T rather than 2,4-D alone is presently recommended in Saskatchewan. However, mixtures of 2,4-D plus 2,4,5-T were 6 to 18% less effective than 2,4-D for aspen control so at least one application in 2 consecutive years will be the minimum requirement for brush control.

Conclusions

An application of 2,4-D at 2 lb/acre followed a year later by a mixture of 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre gave 95% reduction in the population of aspen for 3 years and effective control for at least 5 years. Reduction in the number of aspen shoots was 6 to 18% less from the application mixtures of 2,4-D plus 2,4,5-T at 2 lb/acre than from the same rate of 2,4-D. Prickly rose was controlled for 2 years with a mixture of 2,4-D plus 2,4,5-T (2:1) at 2 lb/acre. However, when both species are present, 2,4-D plus 2,4,5-T must be used and at least two treatments should be applied in consecutive years.

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