CONTROLLING WEEDS FOR ESTABLISHING NATIVE GRASS

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ABSTRACT

Cultivation of marginal lands has led to serious soil management and erosion problems. Re-establishing native grasslands on these fragile soils provides soil protection and restoration, multispecies wildlife habitat, and improves the hydrological cycle. Native grasses, however, are generally characterized by poor germination and slow establishment, and hence do not compete well with weeds. Northern wheatgrass, western wheatgrass, slender wheatgrass, and green needlegrass tolerance to graminicides was evaluated in field trials in Saskatchewan in 1991-1993. Although forage yields were reduced in some cases when double the rate of herbicide recommended to control wild oats and green foxtail was applied, tolerance was generally acceptable to several graminicides. In particular, most grasses showed acceptable tolerance to the selective graminicde tralkoxydim, which provided good control of the main invasive and exotic grasses (wild oats and green foxtail). Fenoxaprop would be a suitable alternative for grass mixtures not containing slender wheatgrass, while imazamethabenz would be suitable for all four species in areas where green foxtail was uncommon. These herbicides show promise as management tools in re-establishing native grasslands.

INTRODUCTION

Portions of the original Canadian Prairie grassland have been cultivated which are now deemed as marginal lands. Continued cultivation of these marginal lands for annual crop production has led to serious soil management and erosion problems in many instances. The restoration of marginal lands to native grasslands is a primary objective of various agricultural and wildlife organizations involved in managing pastures, resource and habitat lands throughout Saskatchewan. These native grasslands, particularly those containing numerous species, provide an important habitat for the protection and maintenance of wildlife. While several studies have demonstrated the use of idle stands of seeded tame grasses by upland nesting ducks (Duebbert and Kantrud, 1974; Duebbert and Lokemoen, 1976; Livezey, 1981; Kantrud, 1993), stands containing mixtures of established native grasses have also been shown to provide soil protection and restoration, quality multi-species wildlife habitat, and improve the hydrological cycle of a specific area (Klett et al. 1984). These benefits are all consistent with long term environmental sustainability objectives as a diverse native grassland, once re-established is a self perpetuating ecosystem requiring no further inputs. Previous reclamation or revegetation efforts, however, have emphasized the establishment of readily available, vigorous exotic grasses on specific sites rather than the establishment of persistent, biologically diverse native plant communities (Call and Roundy, 1991).

Re-establishing native grasslands on previously cropped lands involves certain difficulties. Native grasses are generally characterized by variable germination, specific

moisture requirements for germination and establishment and slow establishment compared to other cultivated crops (Fulbright et al., 1984; Frasier et al., 1987; Ries and Svejcar, 1991). As a result, they do not compete well with weeds (Duebbert et al., 1981). Discriminate use of herbicides during the establishment year of native grasses may be of benefit. However, there are no herbicides registered for use in native grass establishment in Canada and there is very little data available on the sensitivity of these grasses to graminicides in particular.

Research was conducted near Pleasantdale, Melfort, Weldon, and Watrous Sask., from 1991-1993 to determine the seedling tolerance of northern wheatgrass, western wheatgrass, slender wheatgrass, and green needlegrass to three graminicides, tralkoxydim (Achieve, Achieve Extra), imazamethabenz (Assert) and fenoxaprop (Excel or Triumph Plus), alone and with broadleaved weed killers.

MATERIALS AND METHODS

Field experiments were conducted at Pleasantdale (1991), Weldon (1992) Melfort (1993)and Watrous (1992 and 1993) in northeastern Saskatchewan to evaluate native grass tolerance to graminicides. Northern wheatgrass cv. Critana and Elbee, western wheatgrass cv. Rodan and Walsh and slender wheatgrass cv. Revenue and Adanac were tested at both sites. Green needlegrass cv. Lodorm was tested only at Pleasantdale in 1991 and Watrous and Melfort in 1993. The grasses were sown in late May. Herbicides were applied in 110 L ha^{-1} total spray volume when the grasses were in the 2-3 leaf stage. A push type CO_2 pressurized sprayer was used with 275 kPA at Pleasantdale, Melfort and Weldon, and 207 kPA pressure at Watrous. A split block design was used with herbicide treatments within crop blocks. Herbicides and rates varied slightly between sites (Tables 1-3). Data were analyzed using SAS. Data were averaged over siteyears for grasses grown under weed free conditions (Watrous 1992, 1993 and Melfort 1993).

RESULTS AND DISCUSSION

Weed Control. The Pleasantdale (Table 1) and Weldon (Table 2) tests were conducted on marginal land, where Ducks Unlimited was establishing nesting cover. At Pleasantdale, broadleaved weeds, particularly wild mustard and Canada thistle were present throughout the test area. Triumph Plus (fenoxaprop/MCPA/ thifensulfuron) was the only herbicide that controlled broadleaved weeds. Forage yield was affected in all plots except those that were treated with this broad spectrum herbicide. At Weldon, volunteer barley dominated the weed communtity, and as a result, herbicides that were more effective in suppressing v. barley tended to produce the highest yields. Weeded checks were only weeded once, at the time of spraying, and weed regrowth reduced yield in these plots as well. While there were significant differences between treatments, and grass species in some cases, there were no significant species x treatment interactions. At Pleasantdale, green foxtail dry matter yield was significantly higher in the western wheatgrass plots relative to the other grasses (15 g m^{-2} vs 9 g m^{-2}). Wild oats and green foxtail, the predominant grassy weeds, were generally controlled by all herbicides with the exception that difenzoquat and imazamethabenz did not control green foxtail.

Grass Tolerance. Slender wheatgrass seemed to be somewhat sensitive to Triumph Plus under weed free conditions at Watrous in 1992. However, by 1993, forage yield in these plots was similar to or greater than yield from the untreated check. Assert and Achieve did not reduce slender wheatgrass forage yield in the year of application.

Green needlegrass exhibited some sensitivity to the herbicides tested, particularly under weed free conditions at Melfort in 1993. Under heavy weed pressure however,

Table 1. Effect of herbicide treatment on forage yield of native grasses and grass control under broadleaved weed pressure, Pleasantdale 1991. Values are the mean of 4 reps.

Herbicides		Northern wheatgrass		Western wheatgrass		Slender wheatgrass	Green needlegrass	Weed control	
Treatment	Rate kg a.i. ha^{-1}	Critana	Elbee	Rodan	Walsh	Revenue	Lodorm	Wild oats	Green foxtail
		Forage dry weight (g/m^2)						- % control -	
Check, weedy		12	10	10	9	37	16	0	0
Check, weed free		30	40	45	31	127	44	100	100
Hoegrass	0.7	7	14	22	26	75	28	100	100
	1.4	19	17	22	31	68	21	100	100
Avenge	0.7	13	6	13	16	30	12	98	7.5
	1.4	7	10	12	9	16	8	100	45
Assert	0.4	22	24	33	27	146	29	100	36
	0.8	23	13	23	25	77	27	99	38
Achieve	0.25	25	14	37	13	84	17	100	100
	0.50	16	16	23	21	70	19	100	100
Excel	0.088	16	14	23	20	45	18	100	100
	0.176	22	15	23	18	36	9	100	100
Triumph	0.088	62	75	83	46	143	62	99	100
	0.176	55	65	55	57	174	47	100	100
	C.V.	59	78	66	52	83	67	8.8	1.9
	LSD (5%)	20	27	29	18	97	24	8.3	2.4

Table 2. Effect of herbicide treatment on forage yield of native grasses under volunteer barley, wild oat, and green foxtail pressure, Weldon 1992. Values are the mean of 4 reps.

Herbicides		Northern wheatgrass		Western wheatgrass		Slender wheatgrass	Green needlegrass
Treatment	Rate kg a.i. ha^{-1}	Critana	Elbee	Rodan	Walsh	Revenue	Lodorm
		Forage dry weight (g/m^2)					
Check, weedy		3	1 B	2	25	13	17
Check, weed free		1	4 AB	2	30	25	11
Hoegrass	0.7	12	5 AB	3	56	25	16
	1.4	10	5 AB	7	38	23	31
Avenge	0.7	3	8 AB	3	21	11	9
	1.4	2	13 AB	2	17	11	9
Assert	0.4	4	4 AB	6	58	19	23
	0.8	7	5 AB	5	44	13	16
Achieve	0.25	9	4 AB	4	67	21	27
	0.50	10	12 A	3	51	23	23
Excel	0.088	10	9 AB	5	39	28	23
	0.176	13	10 AB	3	35	15	24
Triumph	0.088	9	2 AB	2	22	24	14
	0.176	9	6 AB	4	36	16	26
	C.V.	86	102	102	76	66	81
	LSD (5%)	9	NSF	NSF	NSF	NSF	NSF

Table 3. Effect of herbicide treatment on forage yield of native grasses under weed free conditions. Values are the average 4 reps in three site years (Watrous 1992, Watrous 1993, and Melfort 1993).

Herbicides		Northern wheatgrass		Western wheatgrass		Slender wheatgrass		Green needlegrass
Treatment	Rate kg a.i. ha^{-1}	Critana	Elbee	Rodan	Walsh	Revenue	Adanac	Lodorm
		Forage yield (% of untreated)						
Achieve	0.25	94	90	98	98	104	110	60
	0.50	90	103	96	101	96	100	34
Achieve Extra	0.25	86	118	94	91	-	89	64
	0.50	85	116	93	87	-	99	62
Assert	0.40	99	105	96	99	107	111	60
	0.80	88	103	96	97	111	88	62
Triumph Plus	0.088	93	88	94	95	90	92	51
	0.176	84	93	91	101	131	89	30

forage yields were much higher in plots treated with herbicides that controlled the dominant weeds. This would suggest that, under weedy conditions, herbicide application may be warranted in spite of possible injury to the green needlegrass seedlings.

Although the native grasses showed some sensitivity to the graminicides tested, forage yields were generally acceptable in a weed free situation. The fact that yields were much higher in plots treated with a broad spectrum herbicide than in weeded plots illustrates the need for weed control in establishing native grasses. Native grasses are frequently established on marginal lands where weeds are abundant and cultivation should be avoided. The slow establishment and non-competitive nature of most native grasses make proper weed control in the establishment year critical to long-term forage yield and stability. Although mowing or burning may be used as an alternative once the grass is established, discriminate herbicide use in the establishment year can greatly improve the vigor of the stand and be economical in the long-term.

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REFERENCES

Call, C.A. and Roundy, B.A. 1991. Perspectives and processes in revegetation of arid and semi-arid rangelands. Journal of Range Management, 44(6): 543-549.

Duebbert, H.F. and Kantrud, H.A. 1974. Upland duck nesting related to land use and predator reduction. Journal of Wildlife Management, 38: 257-265.

Duebbert, H.F. and Lokemoen, J.T. 1976. Duck nesting in fields of undisturbed grass-legume cover. Journal of Wildlife Management, 40: 39-49.

Duebbert, H.F., Jacobson, E.T., Higgins, K.F. and Podoll, E.B. 1981. Establishment of seeded grasslands for wildlife habitat in the prairie pothole region. U.S. Department of the Interior, Fish and Wildlife Service Special Science Report - Wildlife, 234. p. 21.

Frasier, G.W., Cox, J.R. and Woolhiser, D.A. 1987. Wet-dry cycle effects on warm-season grass seedling establishment. Journal of Range Management, 40(1): 2-6.

Fulbright, T.E., Wilson, A.M. and Redente, E.F. 1984. Effects of temporary dehydration on growth of green needlegrass (*Stipa viridula* Trin.) seedlings. Journal of Range Management, 37(5): 462-464.

Kantrud, H.A. 1993. Duck nest success on conservation reserve program land in the prairie pothole region. Journal of Soil and Water Conservation, 48(3): 238-242.

Klett, A.T., Duebbert, H.F. and Heismeyer, G.L. 1984. Use of seeded native grasses as nesting cover by ducks. Wildlife Society Bulletin, 12: 134-138.

Livezey, B.C. 1981. Duck nesting in retired cropland at Horicon National Wildlife Refuge, Wisconsin. Journal of Wildlife Management, 45: 27-37.

Ries, R.E. and Svejcar, T.J. 1991. The grass seedling: when is it established? Journal of Range Management, 44(6): 574-576.