Evaluation of Herbicide Applications Following Forage Harvest for Smooth Bedstraw and Dandelion Control in New Brunswick

Évaluation de traitements herbicides appliqués après la récolte du fourrage pour le contrôle du gaillet mollugine et du pissenlit au Nouveau-Brunswick

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Abstract: Smooth bedstraw (*Galium mollugo*) is becoming a serious weed in pastures, hayfields and field margins across the Maritime region. Its invasive nature allows this plant to out-compete forage species, reducing the value of the stand. A trial was established in a high input forage mixture with an infestation of smooth bedstraw near Scotch Lake, New Brunswick. All herbicide treatments had significantly improved grass coverage as compared to the untreated control, with low levels of grass injury. All tested herbicides significantly decreased clover populations within the season of application. Natural clover re-introduction within the second season was noted within many treatments. A high level of smooth bedstraw control was found from all aminopyralid and triclopyr treatments over both evaluation years. DPX-MAT was also effective, with improved control at higher use rates. Dandelion (*Taraxacum officinale*) control within the trial was highly variable, represented by a high LSD value within all evaluations. A significant rate effect was present for triclopyr and dandelion control, while aminopyralid alone or with 2,4-D controlled dandelion at all tested rates. A high rate of DPX-MAT was required for dandelion control. MCPA amine and mecoprop/MCPA/dicamba suppressed dandelion populations within the season following application and were not effective for smooth bedstraw control. Aminopyralid and triclopyr are the best registered options for smooth bedstraw control in New Brunswick forage production. DPX-MAT has promise for smooth bedstraw control and should be evaluated further to determine the weed control spectrum of this new product. To ensure the proper herbicide choice in forage, producers must consider the spectrum of plants present in the field as well as herbicide price.

Résumé: Le gaillet mollugine (*Galium mollugo*) est une mauvaise herbe qui envahit de plus en plus les pâturages, les prairies de fauche et la bordure des champs dans l'ensemble de la région des Maritimes. La nature invasive de cette plante lui permet de faire concurrence aux espèces de fourrage, ce qui diminue la valeur du peuplement. Un essai a été conduit dans un mélange de fourrage de haute production infesté de gaillets mollugines, près de Scotch Lake, au Nouveau-Brunswick. Tous les traitements herbicides ont amélioré considérablement le couvert herbacé par comparaison aux parcelles de contrôle non traitées, et les niveaux de dommages étaient peu élevés. Tous les herbicides évalués ont mené à une diminution importante des populations de trèfles au cours de la saison du traitement. La réintroduction naturelle du trèfle lors de la deuxième saison a été signalée à de nombreux endroits traités. Les traitements d'aminopyralide et de triclopyr ont offert une bonne protection contre le gaillet mollugine au cours des deux années qu'a duré l'essai. Le DPX-MAT s'est également avéré efficace, avec une efficacité accrue avec les doses plus élevées. Le contrôle du pissenlit (*Taraxacum officinale*) variait considérablement dans le cadre de l'essai, étant représenté par une valeur élevée de LSD dans toutes les évaluations. Une dose d'application importante était nécessaire pour le contrôle du triclopyr et du pissenlit, alors que l'aminopyralide utilisé seul ou avec le 2,4-D a contrôlé le pissenlit, et ce, selon toutes les doses évaluées. Un niveau élevé de DPX-MAT était nécessaire pour contrôler le pissenlit. Les produits amine du MCPA et mécoprop + MCPA + dicamba ont éradiqué les populations de pissenlits lors de la saison qui a suivi le traitement et n'étaient pas efficaces dans la lutte contre le gaillet mollugine. L'aminopyralide et le triclopyr constituent les meilleures options homologuées pour le contrôle du gaillet mollugine en ce qui concerne la production fourragère du Nouveau-Brunswick. Le DPX-MAT est prometteur pour lutter contre le gaillet mollugine et devrait faire l'objet d'autres essais afin de déterminer la capacité de destruction des mauvaises herbes de ce nouveau produit. Afin de choisir le bon herbicide pour les fourrages, les producteurs doivent tenir compte de la variété de plantes dans les champs ainsi que du prix de l'herbicide

Introduction

Smooth bedstraw (*Galium mollugo*) is becoming a serious weed in pastures, hayfields and field margins across the Maritime region. This plant typically occurs first along roadsides, progressively moving inwards. Its invasive nature allows it to out-compete

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forage species, reducing the value of the stand. This weed contains the toxin anthraquinone that can cause systemic toxicity and skin disorders in mammals. Forage storage quality issues and poor animal performance on high diets of smooth bedstraw have been observed. Herbicides have shown activity on smooth bedstraw and can become an additional option for management of this weed within New Brunswick.

Materials and Methods

A trial was established in a commercial hayfield with an infestation of smooth bedstraw near Scotch Lake, New Brunswick. The area was a high input hayfield consisting of a forage mixture of timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*), smooth brome (*Bromus inermis*), perennial ryegrass (*Lolium perenne*), white clover (*Trifolium repens*) and red clover (*T. pratense*). Smooth bedstraw and dandelion (*Taraxacum officinale*) were the main weed species present. The trial design was a randomized complete block design evaluating thirteen herbicide treatments compared to an untreated control. Each treatment was applied to a 2m x 6m plot and had four replicates. Herbicide treatments were applied with a CO_2 handheld sprayer at a pressure of 207 kPa in an equivalent water volume of 200 L/ha. Applications were made on June 19, 2009, three weeks after forage harvest. Grasses were 5-10 cm tall with 4-6 leaves. Bedstraw had re-grown to 10 cm in height with 6-8 whorls present and dandelion rosettes were 10 cm wide. Herbicide treatments included four rates of triclopyr (240, 480, 960 and 1920 g ai/ha), two aminopyralid rates (60 and 120 g ai/ha), aminopyralid plus 2,4-D amine (60 g ai/ha plus 840 g ai/ha), high rate of aminopyralid plus 2,4-D amine (120 g ai/ha plus 1440 g ai/ha), MCPA amine (500 g ai/ha), Mecoprop+MCPA+dicamba (600 g ai/ha) and three rates of DPX-MAT (15, 30 and 60 g ai/ha plus 0.2% v/v Agral 90). Visual crop injury and weed control ratings were measured on June 26, 2009; July 14, 2009; August 4, 2009, August 27, 2009; May 18, 2010; June 15, 2010 and August 12, 2010. These ratings were evaluated on a scale of 0-100 where 0 represented no injury or weed control and 100 represented complete control or complete crop loss. An additional visual estimation of grass coverage within each plot was estimated on August 12, 2010. An analysis of variance was performed on all data. Means were separated using the least significant difference test (LSD $P<0.05$). In some cases, data underwent arcsine transformation to pass Bartlett’s test and no difference in the relationship found was noted, therefore the de-transformed means will be presented. Only representative rating dates will be presented.

Results

Significant crop injury was noted at the highest two application rates of triclopyr. Both treatments recovered to commercially acceptable levels by August 27, 2009. No other treatment had significant crop injury within the season of application. No crop injury was noted over any rating date within the following season (data not presented). All herbicide treatments had significantly improved grass coverage as compared to the untreated control on August 12, 2010. The level of weed control was reflected in grass cover, with those treatments with improved weed control having higher grass coverage than the untreated controls (Figure 1).

Table 1. Mean grass injury and grass cover (Percent) after herbicide treatments applied after forage harvest near Scotch Settlement, NB

Treatment	June 26, 2009		July 14, 2009		Aug. 4, 2009		Aug. 27, 2009		Grass Cover	
Untreated	0	c*	0	c	0	b	0	b	46	e
triclopyr (240 g ai)	4	bc	0	c	0	b	0	b	75	bcd
triclopyr (480 g ai)	1	c	4	c	0	b	0	b	88	ab
triclopyr (960 g ai)	8	ab	11	b	5	ab	1	b	90	a
triclopyr (1920 g ai)	11	a	20	a	10	a	8	a	91	a
aminopyralid (60 g ai)	0	c	0	c	0	b	0	b	90	a
aminopyralid (120 g ai)	0	c	0	c	1	b	1	b	91	b
aminopyralid (60 g ai) + 2,4-D amine	1	c	1	c	0	b	0	b	93	a
aminopyralid (120 g ai) + 2,4-D amine	6	b	3	c	0	b	0	b	93	a
MCPA amine	0	c	0	c	0	b	0	b	63	d
mecoprop+MCPA+dicamba	1	c	1	c	0	b	0	b	64	d
DPX-MAT (15 g ai)	0	c	0	c	1	b	0	b	70	cd
DPX-MAT (30 g ai)	0	c	1	c	4	b	0	b	83	abc
DPX-MAT (60 g ai)	1	c	3	c	3	b	0	b	90	a
LSD(0.05)**	4.46		6.61		5.48		1.76		13.63	

*Means followed by the same letter do not differ significantly within columns (p=0.05)
**Least Significant Difference (p=0.05)

Figure 1. Triclopyr applied at 960 g ai/ha (L) as compared to untreated area (R) on August 12, 2010. Similar weed control found in DPX-MAT and aminopyralid treatments.

A high level of smooth bedstraw control was found from all aminopyralid and triclopyr treatments over both evaluation years (Table 2). A slight reduction in control was noted on the final rating date for the lowest rate of triclopyr examined. DPX-MAT was also effective, with a slight rate effect present whereby the 15 g ai/ha application rate exhibited reduced bedstraw control. MCPA amine and mecoprop/MCPA/dicamba were not effective for smooth bedstraw control.

Table 2. Mean smooth bedstraw control (Percent) after herbicide treatments applied after forage harvest near Scotch Settlement, NB

Treatment	June 26, 2009		July 14, 2009		Aug. 27, 2009		June 15, 2010		Aug. 12, 2010	
Untreated	0	e*	0	d	0	e	0	e	0	e
triclopyr (240 g ai)	93	a	94	a	93	a	95	a	86	bc
triclopyr (480 g ai)	94	a	96	a	95	a	98	a	98	a
triclopyr (960 g ai)	95	a	97	a	97	a	98	a	98	a
triclopyr (1920 g ai)	96	a	97	a	98	a	98	a	98	a
aminopyralid (60 g ai)	95	a	96	a	97	a	96	a	98	a
aminopyralid (120 g ai)	91	a	96	a	97	a	98	a	97	a
aminopyralid (60 g ai) + 2,4-D amine	94	a	96	a	98	a	98	a	98	a
aminopyralid (120 g ai)+ 2,4-D amine	95	a	97	a	97	a	98	a	98	a
MCPA amine	5	e	29	c	38	c	33	c	19	d
mecoprop + MCPA + dicamba	29	d	20	c	13	d	13	d	8	de
DPX-MAT (15 g ai)	60	c	79	b	80	b	85	b	76	c
DPX-MAT (30 g ai)	81	b	90	ab	94	a	97	a	97	ab
DPX-MAT (60 g ai)	91	a	96	a	95	a	98	a	97	a
LSD(0.05)**	7.23		13.37		9.89		5.03		11.41	

*Means followed by the same letter do not differ significantly within columns (p=0.05)
**Least Significant Difference (p=0.05)

As shown in Table 3, dandelion control within the trial was highly variable, represented by a high LSD value within all evaluations. A significant rate effect was present for triclopyr and dandelion control, with an application rate of at least 480 g ai/ha required for dandelion control. There was not rate effect for aminopyralid treatments, as aminopyralid alone or with 2,4-D controlled dandelion. A rate of at least 30 g ai/ha of DPX-MAT was required for dandelion control for 2009 evaluations and a rate of 60 g ai/ha was required for control in 2010. MCPA amine and mecoprop/MCPA/dicamba suppressed dandelion populations within the season following application and were marginally effective in 2010.

Discussion

Aminopyralid and triclopyr are the best registered options for smooth bedstraw control in New Brunswick forage production. DPX-MAT has promise for smooth bedstraw control and should be evaluated further to determine the weed control spectrum of this new product. Aminopyralid demonstrated the highest control of dandelion, regardless of rate and 2,4-D mixture. DPX-MAT and triclopyr gave adequate dandelion control at higher use rates. All products effectively controlled clover within the trial areas (data not presented). This may not be desirable as clover is a nitrogen-fixing plant and is encouraged for use in some forage production. Some natural regeneration of clover species was noted in 2010 and the re-establishment of clover following herbicide treatment should be evaluated. To ensure the proper herbicide choice in forage, producers must consider the spectrum of plants present in the field as well as herbicide price.

Table 3. Mean dandelion control (Percent) after herbicide treatments applied after forage harvest near Scotch Settlement, NB

Treatment	June 26, 2009		July 14, 2009		Aug. 27, 2009		June 15, 2010		Aug. 12, 2010	
Untreated	0	f*	0	f	0	e	0	e	0	f
triclopyr (240 g ai)	40	cde	66	bcd	69	bc	66	c	63	cd
triclopyr (480 g ai)	49	bcd	81	abc	83	ab	84	abc	85	ab
triclopyr (960 g ai)	76	ab	88	ab	97	a	94	a	94	a
triclopyr (1920 g ai)	84	a	94	a	98	a	97	a	98	a
aminopyralid (60 g ai)	61	abc	88	ab	97	a	85	abc	85	ab
aminopyralid (120 g ai)	63	abc	95	a	96	a	90	ab	93	a
aminopyralid (60 g ai)+ 2,4-D amine	80	a	96	a	98	a	98	a	98	a
aminopyralid (120 g ai) + 2,4-D amine	86	a	97	a	97	a	98	a	97	a
MCPA amine	15	ef	38	e	60	cd	40	d	48	de
mecoprop + MCPA + dicamba	28	def	59	cde	45	d	25	d	34	e
DPX-MAT (15 g ai)	20	ef	43	de	53	cd	40	d	50	de
DPX-MAT (30 g ai)	35	cde	58	cde	93	a	74	bc	72	bc
DPX-MAT (60 g ai)	60	abc	88	ab	95	a	90	ab	93	ab
LSD(0.05)**	27.96		24.23		20.09		19.62		20.59	

*Means followed by the same letter do not differ significantly within columns (p=0.05)
**Least Significant Difference (p=0.05)

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