



### **Project Identification**

- 1. Title:** Controlling Noxious Weeds and Improving Seed Quality in Established Forage Grass Seed Crops
- 2. Project Number:** 20130355
- 3. Sponsoring Producer Group:** Sask. Forage Seed Development Commission
- 4. Project Location:** Northeast Agriculture Research Foundation  
2 miles south of Melfort, SK on Hwy #6 at the  
Agriculture & Agri-Food Canada Research Station  
Box 1240, MELFORT SK S0E 1A0  
306 752-2776 ext 234  
brandts@xplornet.ca.

**The project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward bi-lateral agreement.**

- 5. Project start and end dates (month & year):** April 1, 2014 to January 1, 2015
- 6. Project Contact Person and Contact Details:**  
Ray McVicar, Executive Director  
SFSDC  
2782 Aster Crescent, REGINA SK S4V 1Z9  
306 789-1958  
raymcvicar@gmail.com

### **Objectives and Rationale**

#### **8. Project Objective:**

SFSDC wanted to demonstrate the importance of controlling noxious and hard to control weeds in established forage grass seed crops. The project used registered herbicides, including those registered under the minor use registration program, for weed control.

#### **9. Project Rationale:**

Forage seed growers in Saskatchewan list weed control as their number one production problem. There are very few herbicides registered for use on established forage grass seed crops. Herbicide manufacturers do not provide company organized demonstrations of their products on forage grass seed crops. Weeds in established forage grass seed crops sometimes go untreated and yield and seed quality suffer. Weeds, including hard-to-control weeds such as dandelion, cleavers and narrowleafed hawk's beard can cause significant yield losses and be deterrents to the production of these crops. Under The Seeds Act, seed lots must meet the standards of seed purity. Lots containing those weeds designated as Noxious can cause the seedlot to be rejected, rendering it not saleable. Producers must aim to produce seed lots of high quality to meet market requirements and



receive higher prices. The benefit of this project is to demonstrate the importance of controlling weeds during the seed production year.

## **Methodology and Results**

### **10. Methodology**

In spring 2013, a summerfallow site was selected at the Melfort Research Farm. The site had been in canola production in 2011. The site was tilled with a field cultivator after the first flush of weeds emerged, and again after a second flush occurred, followed by harrow packing. Thereafter the field was not disturbed to provide a firm seedbed. Just prior to seeding, glyphosate was applied to control the third flush of weeds.

Four strips of each forage crop, 150 feet long by 24 feet wide were seeded to each of the 5 grass species. Perennial Ryegrass was seeded at 20-25 seeds per foot of row and Revenue Slender Wheatgrass at 12–20 seeds per foot of row on June 10, 2013. AC Success Hybrid Bromegrass was seeded at 12-20 seeds per foot of row, Comtal Timothy at 25-30 and Festival Tall Fescue also at 25-30 seeds per foot of row on June 11, 2013. Perennial ryegrass emerged June 18, 2013, and all other forages emerged June 24, 2013. The Perennial Ryegrass did not survive the winter and no treatments were applied in 2014.

In 2014, herbicide treatments were made using a tractor-mounted sprayer (Figure 1) on all four species. The estimated plot size was 12 feet x 24 feet and the treatments were replicated 4 times. Herbicide spray rates and timing are provided in Tables 1-4 below. Treatments were compared to an untreated check. The plots were harvested in the fall of 2014 and yields were determined. Tall Fescue seed set was very low and the crop was not harvested in 2014.

A 25 gram composite sample of each treatment was retained at harvest and submitted to AG Seed Lab, Carrot River, SK for seed purity and germination analysis. For germination on Timothy and Hybrid Bromegrass, a dormancy breaking period of 4 days pre-chill at 5 degrees C was utilized. For Slender Wheatgrass, a dormancy breaking period of 3 days at 5 degrees C was used. No statistical analysis was carried out on seed purity analysis.

Table 1. Application dates and conditions for ADOPT trial on Timothy, 2014

<i><b>Treatment</b></i>	<i><b>Rate</b></i>	<i><b>Spray Volume(l/ac)</b></i>	<i><b>Date / Time</b></i>
Infinity	0.335 l/ac + 0.5 l/ac ammonium sulfate	40	June 12, 2014 3:00 pm
Spectrum	40 ml/ac of Spectrum A and 600 ml/ac of Spectrum B	40	June 12, 2014 5:30 pm
Prestige XC	0.17 l/ac of Prestige XT A + 0.8 l/ac of Prestige XT B	40	June 12, 2014 10:20 am
Attain XC	95 ml/ac of Attain XC A plus 240 ml/ac of Attain XC B	40	June 12, 2014 7:30 pm



Table 2. Application dates and conditions for ADOPT trial on Hybrid Bromegrass, 2014

<i>Treatment</i>	<i>Rate</i>	<i>Spray Volume(l/ac)</i>	<i>Date / Time</i>
Infinity	0.335 l/ac + 0.5 l/ac ammonium sulfate	40	June 12, 2014 2:30 pm
Spectrum	40 l/ac of Spectrum A and 600 ml/ac of Spectrum B	40	June 12, 2014 5:30 pm

Table 3. Application dates and conditions for ADOPT trial on Slender Wheatgrass, 2014

<i>Treatment</i>	<i>Rate</i>	<i>Spray Volume(l/ac)</i>	<i>Date / Time</i>
Refine SG	12 grams/ac + Agral 90 surfactant at 0.2 l per 100 l of spray solution	40	June 13, 7:30-8:00 am

Slender wheatgrass was 25cm tall at the time of application.

Table 4. Application dates and conditions for ADOPT trial on Tall Fescue, 2014

<i>Treatment</i>	<i>Rate</i>	<i>Spray Volume(l/ac)</i>	<i>Date / Time</i>
Refine SG	12 grams/ac + Agral 90 surfactant at 0.2 l per 100 l of spray solution	40	June 13, 2014 7:30-8:00 am
Spectrum	40 ml/ac of Spectrum A and 600 ml/ac of Spectrum B	40	June 12, 2014 5:30 pm
Prestige XC	0.17 l/ac of Prestige XT A + 0.8 l/ac of Prestige XT B	40	June 12, 2014 10:20 am
Attain XC	95 ml/ac of Attain XC A plus 240 ml/ac of Attain XC B	40	June 12, 2014 7:30 pm

Evaluation:

The date, crop stage and weed stage were recorded when the herbicides were applied.

The major weed species in check plots were noted at herbicide application. Per cent visual crop tolerance was rated at 4-7 and 28-35 days after application. Per cent visual weed control was rated at 28-35 days after herbicide application.

Herbicide tolerance ratings were made June 16, 2014, and repeated again July 15, 2014. Herbicide tolerance ratings were made on a 0-100% scale where 0% rating indicated that the crop was completely killed therefore had no tolerance, while 100% indicated that there was no evidence of crop damage. Weed control ratings were the inverse of tolerance ratings where 100% control indicated that all plants of that weed species were completely killed while a 0% rating indicated that we saw no evidence of damage to the weed species.

Forage grass crop seed yields (g/plot) were measured at harvest. Unfortunately we were unable to harvest the Tall Fescue seed yields in fall of 2014 as very little seed was set. Percent germination as well as seed purity was determined in an accredited seed test laboratory to demonstrate the importance of controlling weeds in the field in the year of seed production and on increasing the value and marketability of the seed lot.



## 11. Results

**Note to Reader: This project was designed as a one year demonstration only. All herbicides used are registered products for that crop and as such have been proven effective and safe in longer term testing.**

### 1. Comtal Timothy

Crop tolerance of established timothy to Prestige XC, Spectrum, Infinity or Attain XC was excellent (Table 5). Dandelion was the only species that was uniform enough in the plots to be rated for weed control. Initial control of dandelion by Prestige XC, Spectrum and Infinity was fair, and control by Prestige XC and Spectrum improved later (4-5 weeks after application). Attain XC which is not registered for dandelion control had a weak effect on this species. Seed yield of timothy tended to be lower for all herbicide treatments compared with the Untreated Check, although these differences were not statistically significant.

Seed purity analysis (Table 6) shows the importance of controlling hard to kill weeds including primary and secondary noxious weeds in established Timothy. Seed quality is greatly improved and the seed sample more valuable when these weeds are controlled in the field. Reducing the number of weed seeds in the sample before the crop is cleaned in the seed cleaning plant improves the marketability and value of the crop.

### 2. Success Hybrid Brome (Figure 5)

Tolerance of established hybrid brome to both Infinity and Spectrum was excellent (Table 7), but control of dandelion was only fair although Infinity appeared somewhat better than Spectrum. Both herbicides reduced seed yield by more than 25% compared with the Check, although this difference was not statistically significant. It is unclear why this reduction occurred, but results do suggest that we may want to look closely at herbicide timing to avoid risk of seed yield reduction as this crop was sprayed slightly later than label directions.

Seed purity analysis (Table 8) shows the importance of controlling hard to kill weeds including primary and secondary noxious weeds in established Hybrid Brome. Reducing the number of weed seeds in the sample before the crop is cleaned in the seed cleaning plant improves the marketability and value of the crop.

### 3. Revenue Slender Wheatgrass (Figure 3 and Figure 6)

Refine SG had good crop tolerance on established Slender wheatgrass, limited effect on dandelion and no impact on seed yield (Table 9).

Seed purity analysis (Table 10) shows the importance of controlling hard to kill weeds including primary and secondary noxious weeds in established Slender wheatgrass. Seed quality is greatly improved and the seed sample more valuable when these weeds are controlled in the field.

### 4. Festival Tall Fescue (Figure 2 and Figure 7)

Crop tolerance of tall fescue to Prestige XC and Spectrum herbicides was excellent. Spectrum provided slightly better cleavers and dandelion control and slightly lower dandelion control than Prestige XC (Table 11). Attain XC and Refine SG showed some



slight yellowing of tall fescue after application but this was no longer evident at the later tolerance rating. Prestige XC, Spectrum and Refine SG provided good control of Hawk's Beard. At 28-35 days after application, it was hard to find dandelion in all the Check treatments, making it impossible to do complete ratings for control. However cleavers and Hawk's Beard were well distributed in all plots and were rated.

## **12. Conclusions and/or Recommendations**

Crop tolerance of established Timothy to Prestige XC, Spectrum, Infinity or Attain XC was excellent but seed yield was not enhanced and may have been reduced by some of these treatments. None of the yield differences were statistically significant.

Crop tolerance to Infinity or Spectrum applied to established hybrid bromegrass was rated excellent, but there may be more subtle damage since both tended to reduce seed yield. However, the yield differences were not statistically significant. Hybrid bromegrass develops sooner in the season and so extra care must be taken to ensure that herbicides are not applied later than label directions.

Refine SG, did not show any crop tolerance issues on established slender wheatgrass. Refine SG herbicide treatment did not enhance Slender wheatgrass seed yield which may have reflected limited weed competition in either year.

Crop tolerance of tall fescue to Prestige XC and Spectrum herbicides was excellent. Attain XC and Refine SG showed some slight yellowing of tall fescue after application but this was no longer evident at the later tolerance rating. Spectrum provided slightly better cleavers and dandelion control and slightly lower dandelion control than Prestige XC. Prestige XC, Spectrum and Refine SG provided good control of Narrowleafed Hawk's beard.

Seed purity analysis indicated the importance of controlling hard to kill weeds including primary and secondary noxious weeds in established forage grass seed crops. Seed quality is greatly improved and the seed sample more valuable when these weeds are controlled in the field. Reducing the number of weed seeds in the sample before the crop is cleaned in the seed cleaning plant improves the marketability and value of the crop.

## **Supporting Information**

### **13. Acknowledgements:**

This project was supported financially and with signage by Saskatchewan Ministry of Agriculture through their ADOPT program. We would also like to thank DuPont Canada and BASF Canada for supplying the herbicides for the project as well as DLF Pickseed for supplying the seed in 2013.

Thank you to Clayton Myhre, DLF Pickseed and Al Foster, Saskatchewan Ministry of Agriculture for their cooperation in planning and carrying out this project. Thank you to the Directors and producers of the Saskatchewan Forage Seed Development Commission for their guidance in planning this project.

Special thanks to Stewart Brandt, Brett Mollison and all the crew at NARF for their advice, expertise, time and efforts to carry out this project.

## **14. Appendices**



Table 5. Herbicide tolerance (%) at 4-7 and 28-35 days, weed control (%) at 28-35 days after application of Prestige XC, Spectrum, Infinity or Attain XC on established Timothy.

	Treatment				
	Check	Prestige XC	Spectrum	Infinity	Attain
Crop Tolerance at 4-7 Days (%)	100	100	100	100	100
Crop tolerance at 28-35 Days (%)	100	100	100	100	100
Dandelion Control at 4-7 Days (%)	0	62.5	62.5	60.0	20.0
Dandelion Control at 28-35 Days (%)	0	100	95.0	68.5	12.5
Seed Yield (kg/ha)	672	489	578	612	557

Herbicide effect on seed yield was not statistically significant.

Table 6. Seed Purity and germination analysis of seed samples of Timothy treated in 2014 (year after establishment) with Prestige XC or Spectrum or Infinity of Attain XC compared with the untreated check.

Treatment	Check	Prestige XC	Spectrum	Infinity	Attain XC
Germination %	84	79	86	86	87
Primary Noxious weed seeds-total	11	6	1	11	10
• Cleavers	9	5	1	11	10
• Perennial Sowthistle	1	1			
• Canada Thistle	1				
Secondary Noxious weed seeds-total	1			21	
• Stinkweed	1				
Other Weed Seeds-total	108	26	71	62	40
• Lamb's Quarters	25				
• Cinquefoil	16				
• Common plantain	40				
• Shepherd's purse	12				
• Hawksbeard	4		10	10	10
• Green Foxtail	4	10	30	10	

Table 7. Herbicide tolerance (%) and weed control at 4-7 days or 28-35 days after application of Infinity or Spectrum on Hybrid Bromegrass and seed yield in the year after establishment.

	Treatment		
	Check	Infinity	Spectrum
Crop Tolerance at 4-7 Days (%)	100	100	100
Crop tolerance at 28-35 Days (%)	100	100	100



Dandelion Control at 4-7 Days (%)	0	43	45
Dandelion Control at 28-35 Days (%)	0	50	30
Seed Yield (kg/ha)	170	126	125

Herbicide effect on seed yield was not statistically significant.

Table 8. Seed Purity and germination analysis of seed samples of Hybrid Bromegrass treated in 2014 (year after establishment) with Spectrum or Infinity compared with the untreated check.

Treatment	Check	Spectrum	Infinity
Germination %	86	87	80
Primary Noxious weed seeds-total	16	2	12
• Cleavers	8	2	10
• Perennial Sowthistle	8		
Secondary Noxious weed seeds-total	14	29	104
• Wild Oats	14	18	104
Other Weed Seeds-total	490	491	322
• Lamb's Quarters	220		
• Barnyard grass	80	260	154
• Wild buckwheat	50		40
• Hawksbeard	20	20	
• Spiny sowthistle	20		
• Green foxtail	40	150	
• Foxtail barley	30	30	12

Table 9. Herbicide tolerance (%) at 4-7 and 28-35 days, weed control at 28-35 days after application of Refine SG on Slender Wheatgrass in the year after establishment.

	Treatment	
	Check	Refine SG
Crop Tolerance at 4-7 Days (%)	100	100
Crop tolerance at 28-35 Days (%)	100	100
Dandelion Control at 4-7 Days (%)	0	33
Dandelion Control at 28-35 Days (%)	0	100
Seed Yield (kg/ha)	1086	1052

Herbicide effect on seed yield was not statistically significant.



Table 10. Seed Purity and germination analysis of seed samples of Slender Wheatgrass treated in 2014 (year after establishment) with Refine SG compared with the untreated check.

Treatment	Check	Refine SG
Germination %	86	81
Primary Noxious weed seeds-total	32	20
• Cleavers	32	20
Secondary Noxious weed seeds-total	7	4
• Night-flowering catchfly	4	
• Stinkweed	2	4
• Wild Oats	1	
Other Weed Seeds-total	67	108
• Foxtail barley	10	28
• Barnyard grass	10	52
• Wild buckwheat	4	
• Lamb's Quarters	3	
• Hawksbeard	1	

Table 11. Herbicide tolerance (%) at 4-7 and 28-35 days, weed control at 28-35 days after application of Prestige XC, Spectrum, Attain XC and Refine SG on Tall Fescue in the year after establishment.

	Treatment				
	Check	Prestige XC	Spectrum	Attain XC	Refine SG
Crop Tolerance at 4-7 Days (%)	100	100	100	95	95
Crop tolerance at 28-35 Days (%)	100	100	100	100	100
Dandelion Control at 4-7 Days (%)	0	55.0	26.0	12.5	26.0
Cleavers Control at 28-35 Days (%)	0	70.0	92.5	10.0	67.5
Hawk's Beard Control at 28-35 Days (%)	0	90.0	97.5	36.3	97.5



Figure 1. Tractor mounted sprayer Melfort June 2014.  
Source: SFSDC



Figure 2. Established tall fescue Melfort  
June 2014 Source: SFSDC



Figure 3. Established slender wheatgrass Melfort  
June 2014 Source: SFSDC



Figure 4. ADOPT field sign Melfort  
July 2014 Source: SFSDC



Figure 5. Herbicide on Hybrid Bromegrass Melfort  
July 2014 Source: SFSDC



Figure 6. Herbicide on Slender Wheatgrass Melfort  
July 2014 Source: SFSDC



Figure 7. Herbicide on Tall Fescue Melfort  
July 2014 Source: SFSDC



## **15. Authors**

Allan Foster SMA, Tisdale; Ray McVicar, SFSDC Regina; Stu Brandt NARF, Melfort