Forb Herbicide Tolerance Trial, 2005-2007
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Introduction

Weed control is an important part of seed production. Competition from weeds decreases plant growth, health, and seed production. Many herbicide choices are available to control broadleaf weeds in grass fields and to control grasses among broadleaf plants; however, there are no known herbicides for controlling broadleaf weeds among our broadleaf forb releases. There is high demand for selective herbicides registered for use on seed production fields of rangeland forbs and half shrubs. A large amount of Plant Materials Center (PMC) resources are allocated annually to weed control in forb seed production fields by hand rouging and mechanical tillage. Selective weed control products for rangeland forbs and half shrubs are highly desirable and would reduce labor costs and potentially increase seed production. This study was designed as an initial screening of several herbicides with potential for weed control in forb and half shrub seed production fields. The goal of this project is to find herbicides that control broadleaf and grass weeds while not significantly reducing seed yields of forbs grown for seed production. *Trade names are used solely to provide information. Mention of trade names does not constitute a guarantee of the product by USDA-NRCS nor does it imply endorsement over comparable products that are not named.*

2005 Initial Herbicide Screening

Materials and methods

Appar blue flax (*Linum perenne*) and Maple Grove Lewis flax (*L. lewisii*) seeds were planted into flats of 10 cubic inch conetainers at the PMC greenhouse on December 9, 2005. Delar small burnet (*Sanguisorba minor*) was planted on January 5, 2006. When plants reached approximately 3 to 5 inches in height, they were delivered to UI Weed Scientist, Pam Hutchinson, for treatment with potential herbicides. Ten treatments including a non-treated check were evaluated (table 1). Herbicide treatments took place on February 2, 2006. Experimental design consisted of eight replications; each replicate consisted of one plant. All replicates were treated in a single spraying in a spray chamber. The herbicide application occurred 55 days after planting (DAP) for flax species and 28 DAP for small burnet. Plants were returned to the greenhouse following treatment and evaluated for phytotoxicity after 20 days.

Treatments included standard rates of the following herbicides: Buctril, Prowl H_20, MCPA, Chateau, Stinger, Poast, Plateau, Basagran, Sencor and a non-treated control. For a summary of the herbicides used in these trials, see the appendix at the end of the discussion.

Results

From the initial screening, Poast showed little damage to any of the three species and looks good for grass control. Plateau and Prowl both had very little phytotoxicity on the three species tested, and all appear to have good potential for broadleaf weed control on these forb crops. Basagran and Sencor had light phytotoxicity on Maple Grove plants (16.88 and 18.75% respectively).

Chateau also had light to moderate phytotoxicity on Appar and Delar (17.50 and 26.25% respectively).

Table 1. Initial herbicide tolerance screening.

Treatment	Trade Name	Appar	Maple Grove	Delar
		Phytotoxicity		
		----------%----------		
Check	No trtmnt	0.00 e	0.00 d	0.00 d
Sethoxydim+COC	Poast	0.00 e	0.00 d	8.75 cd
MCPA amine	MCPA	32.50 cd	72.50 a	73.75 ab
Clopyralid	Stinger	36.25 bc	60.00 a	60.00 b
Bromoxynil	Buctril	52.50 ab	36.25 bc	85.63 a
Bentazon+COC	Basagran	48.75 abc	16.88 cd	93.13 a
Metribuzin	Sencor	60.00 a	18.75 cd	90.00 a
Imazapic	Plateau	0.00 e	0.00 d	1.25 d
Pendimethalin	Prowl	0.00 e	0.00 d	5.00 d
Flumioxazin	Chateau	17.50 d	55.00 ab	26.25 c
cv (0.05)		16.46	20.93	21.02

2006 Maple Grove Field Trial

Materials and Methods

In 2005 a 3.2 acre seed production field of Maple Grove was established at the PMC home farm in Aberdeen. In 2006 it was discovered that the field had a significant contamination with Appar blue flax. It was decided to initiate an herbicide tolerance trial on this established field using a similar selection of herbicides as used in the initial screening trial.

The field was marked off into 24 X 75' plots. The plots were arranged in 3 blocks with 14 treatments per block. The only fall treatment (Plateau) was applied on December 8, 2006. The remaining spring treatments took place on May 20, 2007. All treatments were applied as a foliar broadcast using a backpack sprayer calibrated at 35 pounds per square inch (psi) and delivering 15 gallons/acre. Treatments were conducted by Pam Hutchinson, University of Idaho. On June 5, 2007 all plots were evaluated visually for percent phytotoxicity.

Because of weed presence in some plots and the risk of weed seed spreading to adjacent seed production fields, it was decided to mow the entire field except for a single row running through the center of the plots to be left for the seed production evaluation. Mowing occurred on June 21, 2007. Seed was harvested on 3 foot of row by hand from each plot on July 10, 2007. Weed control was not evaluated statistically; however a general idea of weed control was obtained from the plots at the time of evaluation.

All data were analyzed with a one-way ANOVA and means separated with a Tukey's test using Statistix 8 analytical software.

Results

The most prevalent broadleaf weeds in the plots were meadow salsify (*Tragopogon dubius*) and prickly lettuce (*Lactuca serriola*). At the time of evaluation Maple Grove appeared to have

excellent tolerance to the spring application of Plateau (10.0%), the Plateau and Prowl treatment (13.3%) and the Basagran treatment (16.7%) (table 2). Moderate phytotoxicity came from the Targa+Stinger, MCPA, Targa, Stinger, and Prowl treatments. Treatments of Buctril, Bronate and fall applied Plateau caused severe damage to Maple Grove plants and essentially eliminated seed production. The Targa+Stinger treatment used a lower application rate of Stinger than the Stinger alone treatment (2 lb v. 3 lb/gal). Consequently the Stinger plots had a higher phytotoxicity and weed control rating and lower seed yields than the Targa+Stinger treatment.

Table 2. Phytotoxicity and seed production.

Treatment	Trade name	Rate	Unit	Phytotoxicity (6/5)	Seed/ac (7/10)	Weed control
				-----%-----	-----lb-----	
Bromoxynil	Buctril	2	Lb/gal	96.7 a	3 b	Moderate
Bromoxynil+MCPA	Bronate	4	Lb/gal	91.7 a	3 b	Excellent
Imazapic	Plateau (fall)	2	Lb/gal	86.7 a	31 b	Poor
Metribuzin	Sencor	75	5aw/w	56.7 b	168 ab	Moderate
Flumioxazin	Chateau	51	%	53.3 bc	111 ab	Good
Pendimethalin	Prowl	3.8	Lb/gal	36.7 cd	326 a	Moderate
Clopyralid	Stinger	3	Lb/gal	36.7 cd	197 ab	Excellent
Quizalafop	Targa	.88	Lb/gal	30.0 de	280 ab	Moderate
MCPA	MCPA	4	Lb/gal	26.7 def	289 ab	Good
Quiz + Clop	Targa + Stinger	.88+2	Lb/gal	23.3 def	294 ab	Good
Bentazon	Basagran	4	Lb/gal	16.7 efg	229 ab	Moderate
Imaz + Pendi	Plateau + Prowl	2+3.8	Lb/gal	13.3 efg	3 b	Poor
Imazapic	Plateau (spring)	2	Lb/gal	10.0 fg	3 b	Moderate
Check	No treatment	na	Na	0.00 g	245 ab	Poor
cv (0.05)				18.5	319	

Best seed production came from the Prowl treatment (326 lb/ac) despite having a moderately high phytotoxicity rating (36.7%) and a poor weed control rating (figure 1). Targa+Stinger, MCPA, Targa, the non-treated check and the Basagran treatments also had high seed yields (294, 289, 280, 245 and 229 lb/ac respectively). Contrary to the initial trial, MCPA treatments showed only moderate phytotoxicity and had excellent seed production.

Despite its low phytotoxicity rating, the spring applications involving Plateau had essentially no seed production. At the time of the evaluation, Maple Grove and salsify plants in the Plateau plots had produced very few flowers, and the flowers that formed had not opened (figure 2). The fall application of Plateau did severe damage to the plants in the plot, and many plants remained stunted throughout the following season (figure 3). Others however did flower, but seed production was minimal.

Targa used with the low rate of Stinger had high seed yields and relatively good herbicide tolerance with good weed control. Targa would have provided grass control, while Stinger is produced specifically to control weeds in the Asteraceae family which includes salsify and lettuce (figure 4). Using a low rate of Stinger appeared to provide sufficient broadleaf control with minimal damage to the Maple Grove plants.

Figure 1. Plot showing Prowl treatment. Prowl provided excellent seed yields despite poor weed control.

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Figure 2. Plot of spring applied Plateau (6/5). Plants appeared healthy, yet flowers never opened for pollination resulting in low seed production.

Figure 3. Fall applied Plateau. Many plants are stunted and never flowered. Flowering plants in the plot may have been the result of wind-skip at time of application.

Figure 4. Plots of Targa+Stinger had good seed yields and high weed control.

Appendix: Summary of tested herbicides (PNW Weed Management Handbook, 2003)

Basagran: A selective herbicide to control many broadleaf weeds and yellow nutsedge. Rain within 24 hours after application may reduce effectiveness. Basagran is a postemergence contact spray, so thorough coverage is essential.

Buctril: A selective, postemergence, contact herbicide. Controls some weeds resistant to 2,4-D. Can be safely applied to seedling grains and grasses. Has little soil activity.

Chateau: A long lasting residual broad spectrum herbicide that controls annual broadleaf and grass weeds.

MCPA: A postemergence, selective, translocated phenoxy herbicide. Material is less phytotoxic to some crops.

Plateau: A selective postemergence herbicide effective controlling broadleaf weeds and some grasses.

Poast: A selective, postemergence grass herbicide. It controls most annual and perennial grasses. Using a crop oil concentrate enhances activity.

Prowl: Depending on the crop, this is a selective, preplant, preemergence, and early postemergence herbicide that is used to control annual broadleaf and grass weeds.

Sencor: A selective pre-and postemergence herbicide to control grass and broadleaf weeds.

Stinger: A highly translocated, selective herbicide active primarily through foliage of broadleaf herbaceous weeds (mostly the Asteraceae, Fabaceae, and Polygonaceae families). This herbicide is known to accumulate and persist in crop residue and compost.

Targa: Same chemical as Poast, a grass herbicide.