Post Emergence Control of Broadleaf Weeds and Phytotoxicity Evaluations

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Introduction

Broadleaf weed control and turfgrass phytotoxicity evaluations were conducted on a stand of mature 'SR-4200' perennial ryegrass (*Lolium perenne* L.) at The Valentine Turfgrass Research Center, Penn State University, University Park, Pa. The objectives of the study were to determine the efficacy of selected broadleaf weed herbicides for the control of dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*), buckhorn plantain (*Plantago lanceolata*), and mouseear chickweed (*Cerastium vulgatum*) in perennial ryegrass and the phytotoxicity of these compounds on perennial ryegrass.

Methods and Materials

All turfgrass test areas were rated by recording the population of dandelion, white clover, buckhorn plantain, and mouseear chickweed species prior to the application of any treatment, on a plot by plot basis. The rating was conducted by way of visual interpretation. This was repeated following the application of materials and a percent control of the population was produced. The test plots were 18 ft^2 and had approximately 75 percent broadleaf weed cover.

The study was a randomized complete block design with three replications. Applications were applied on September 16, 2013 (FALL) and June 6, 2014 (SPRING) using a three foot CO_2 powered boom sprayer calibrated to deliver 40 gpa using one, flat fan, TP9504EVS nozzle at 40 psi (Figure 1).

The test site (Figure 2) was mowed at three inches weekly with a rotary mower at 3.5 inches with clippings returned to the site. The test site was irrigated to prevent moisture stress.

Results and Discussion

Perennial ryegrass phytotoxicity was rated seven times during the study (Table 1). Although there was some unacceptable phytotoxicity is dissipated quickly and did not re-appear.

Broadleaf weed phytotoxicity was rated six times during the study (Table 2). Weed phytotoxicity was recorded as would be expected in an efficacy study.

Perennial ryegrass color and turf quality was each rated two times during the study (Table 3). There was no rating date where unacceptable color or quality was found.

The control of dandelion, white clover, and buckhorn plantain was rated seven times, and mouseear chickweed was rated six times during the study (Table 4-7). Upon review of the data it is apparent that these products will control these broadleaf weeds. Overall control was excellent in this study.

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Table 1. Evaluations of perennial ryegrass phytotoxicity, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2013 and 2014.

Treatment	Rate	Timing	(----------P. Rye Phyto----------)						
			(--------2013--------)			(----------2014----------)			
	FL OZ/M		9/23	9/27	10/7	6/10	6/16	6/20	7/9
ON DECK	0.75	FALL	1.0	1.0	1.0	1.7	2.3	2.7	1.0
ON DECK	0.75	FALL/SPRING	1.0	1.0	1.0	2.3	3.3	4.7	1.0
ON DECK	0.75	FALL	1.0	1.0	1.0	1.7	2.7	2.7	1.0
HM 8802A	2 QT/100 GAL								
ON DECK	0.75	FALL/SPRING	1.0	1.0	1.0	2.7	4.7	6.0	1.0
HM 8802A	2 QT/100 GAL								
ON DECK	0.875	FALL	1.0	1.0	1.0	1.3	3.0	4.3	1.0
ON DECK	0.875	FALL/SPRING	1.0	1.0	1.0	2.7	4.3	4.3	1.0
UNTREATED CHECK			1.0	1.0	1.0	1.0	2.7	1.0	1.0
ON DECK	0.875	FALL	1.0	1.0	1.0	1.3	3.3	4.0	1.0
HM 8802A	2 QT/100 GAL								
ON DECK	0.875	FALL/SPRING	1.0	1.0	1.0	3.0	4.3	5.0	1.0
HM 8802A	2 QT/100 GAL								
ON DECK	1	FALL	1.0	1.0	1.0	1.7	2.0	2.7	1.0
ON DECK	1	FALL/SPRING	1.0	1.0	1.0	2.3	4.3	4.3	1.0
ON DECK	1	FALL	1.0	1.0	1.0	1.7	2.7	6.0	1.0
HM 8802A	2 QT/100 GAL								
ON DECK	1	FALL/SPRING	1.0	1.0	1.0	2.3	3.0	4.3	1.0
HM 8802A	2 QT/100 GAL								
HM 1333	0.25	FALL/SPRING	1.0	1.0	1.0	2.3	3.0	2.7	1.0
090613-A	0.6								

Table 2. Evaluations of broadleaf weed phytotoxicity in 2013 and 2014 where 0 = dead and 10 = no phytotoxicity.

Treatment	Rate	Timing	(----------Weed Phyto----------)					
			(--------2013--------)			(--------2014---------)		
	FL OZ/M		9/23	9/27	10/7	6/10	6/16	7/9
ON DECK	0.75	FALL	7.3	6.3	6.3	2.0	2.3	1.0
ON DECK	0.75	FALL/SPRING	7.0	6.7	7.0	2.3	6.3	1.0
ON DECK	0.75	FALL	7.3	7.0	6.7	1.0	5.0	1.0
HM 8802A	2 QT/100 GAL							
ON DECK	0.75	FALL/SPRING	7.3	6.7	6.7	4.0	7.3	1.0
HM 8802A	2 QT/100 GAL							
ON DECK	0.875	FALL	7.7	6.7	7.0	1.3	4.7	1.0
ON DECK	0.875	FALL/SPRING	8.0	6.7	6.7	2.0	7.3	1.0
UNTREATED CHECK			1.0	1.0	1.0	1.0	1.0	1.0
ON DECK	0.875	FALL	7.7	7.0	8.0	1.7	3.7	1.0
HM 8802A	2 QT/100 GAL							
ON DECK	0.875	FALL/SPRING	7.7	7.3	8.3	3.3	6.3	1.0
HM 8802A	2 QT/100 GAL							
ON DECK	1	FALL	5.0	7.0	7.0	1.7	3.7	1.0
ON DECK	1	FALL/SPRING	5.3	7.0	8.3	2.7	5.3	1.0
ON DECK	1	FALL	8.0	6.3	9.0	1.0	3.7	1.0
HM 8802A	2 QT/100 GAL							
ON DECK	1	FALL/SPRING	7.3	7.3	7.0	3.0	7.7	1.0
HM 8802A	2 QT/100 GAL							
HM 1333	0.25	FALL/SPRING	7.3	7.0	5.7	2.7	7.0	1.0
090613-A	0.6							

Table 3. Evaluations of perennial ryegrass color where 1 = brown, 7 = acceptable, and 10 = darkest green and quality where 1 = dead, 7 = acceptable, and 10 = highest quality in 2014.

Treatment	Rate	Timing	Turf Color		Turf Quality	
	FL OZ/M		6/20	7/9	6/20	7/9
ON DECK	0.75	FALL	8.3	8.0	7.3	6.3
ON DECK	0.75	FALL/SPRING	8.0	8.0	7.7	8.7
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL	8.3	8.0	7.3	7.3
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL/SPRING	8.3	8.0	7.3	8.3
ON DECK	0.875	FALL	8.7	8.0	7.3	6.7
ON DECK	0.875	FALL/SPRING	8.7	8.0	7.3	7.7
UNTREATED CHECK			7.0	8.0	3.7	4.7
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL	8.3	8.0	7.7	6.7
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL/SPRING	8.0	8.0	7.7	8.7
ON DECK	1	FALL	8.7	8.0	7.3	7.0
ON DECK	1	FALL/SPRING	8.3	8.0	7.3	9.0
ON DECK HM 8802A	1 2 QT/100 GAL	FALL	8.0	8.0	7.0	7.0
ON DECK HM 8802A	1 2 QT/100 GAL	FALL/SPRING	8.7	8.0	7.7	9.0
HM 1333 090613-A	0.25 0.6	FALL/SPRING	8.3	8.0	7.7	8.0

Table 4. Percent control of the dandelion populations following applications of selected herbicides in fall 2013 and spring 2014.

Treatment	Rate	Timing	(----------Dandelion Control[1]----------)						
			(----------2013----------)			(----------2014----------)			
	FL OZ/M		10/7	10/18	11/15	6/6	6/27	7/9	8/4
ON DECK	0.75	FALL	61.2 b	97.8 b	100.0 a	30.0 b	32.5 e	12.5 d	12.5 bc
ON DECK	0.75	FALL/SPRING	11.1 c	100.0 a	100.0 a	75.6 a	100.0 a	100.0 a	97.3 a
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL	76.7 ab	100.0 a	100.0 a	65.6 a	46.7 cde	42.2 b	31.1 b
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL/SPRING	92.4 a	100.0 a	100.0 a	93.3 a	100.0 a	100.0 a	99.0 a
ON DECK	0.875	FALL	85.6 ab	100.0 a	98.9 a	75.6 a	43.3 de	16.7 cd	16.7 bc
ON DECK	0.875	FALL/SPRING	84.1 ab	100.0 a	100.0 a	75.6 a	100.0 a	100.0 a	100.0 a
UNTREATED CHECK			0.0 c	0.0 c	0.0 b	0.0 c	0.0 f	0.0 d	0.0 c
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL	83.9 ab	100.0 a	100.0 a	62.8 a	58.9 bcd	17.8 cd	23.3 bc
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL/SPRING	82.9 ab	100.0 a	100.0 a	90.5 a	100.0 a	100.0 a	99.0 a
ON DECK	1	FALL	85.6 ab	100.0 a	100.0 a	62.2 a	62.2 bc	17.8 cd	20.0 bc
ON DECK	1	FALL/SPRING	78.3 ab	100.0 a	100.0 a	71.7 a	100.0 a	100.0 a	91.7 a
ON DECK HM 8802A	1 2 QT/100 GAL	FALL	92.4 a	100.0 a	98.7 a	73.6 a	70.1 b	37.6 bc	33.5 b
HM 1333 090613-A	0.25 0	FALL/SPRING	89.6 ab	100.0 a	99.0 a	68.5 a	100.0 a	100.0 a	100.0 a

1- Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT)

Table 5. Percent control of the white clover populations following applications of selected herbicides in fall 2013 and spring 2014.

Treatment	Rate	Timing	(----------White Clover Control[1]----------)						
			(----------2013----------)			(----------2014----------)			
	FL OZ/M		10/7	10/18	11/15	6/6	6/27	7/9	8/4
ON DECK	0.75	FALL	62.2 ab	80.2 b	100.0 a	100.0 a	94.9 a	85.1 b	82.9 c
ON DECK	0.75	FALL/SPRING	47.9 b	93.4 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL	74.0 a	96.7 a	100.0 a	100.0 a	100.0 a	95.8 ab	92.3 abc
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL/SPRING	67.3 ab	95.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	0.875	FALL	77.0 a	97.1 a	100.0 a	100.0 a	100.0 a	94.9 ab	95.6 ab
ON DECK	0.875	FALL/SPRING	64.3 ab	94.6 a	100.0 a	100.0 a	100.0 a	100.0 a	99.3 a
UNTREATED CHECK			0.0 c	0.0 c	0.0 b	0.0 b	0.0 b	0.0 c	0.0 d
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL	80.7 a	97.6 a	100.0 a	100.0 a	96.7 a	100.0 a	99.5 a
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL/SPRING	84.0 a	98.5 a	100.0 a	100.0 a	100.0 a	100.0 a	99.5 a
ON DECK	1	FALL	77.1 a	96.6 a	100.0 a	100.0 a	96.7 a	94.9 ab	84.8 bc
ON DECK	1	FALL/SPRING	72.1 ab	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	1 2 QT/100 GAL	FALL	76.7 a	99.3 a	100.0 a	100.0 a	100.0 a	96.7 ab	92.0 abc
ON DECK HM 8802A	1 2 QT/100 GAL	FALL/SPRING	70.0 ab	99.3 a	100.0 a	100.0 a	100.0 a	100.0 a	99.3 a
HM 1333 090613-A	0.25 0	FALL/SPRING	78.2 a	92.1 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a

1- Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT)

Table 6. Percent control of the buckhorn plantain populations following applications of selected herbicides in 2013 and evaluated in 2013 and 2014.

Treatment	Rate	Timing	(----------Plantain Control[1]----------)						
			(----------2013----------)			(----------2014----------)			
	FL OZ/M		10/7	10/18	11/15	6/6	6/27	7/9	8/4
ON DECK	0.75	FALL	55.6 ab	88.9 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	0.75	FALL/SPRING	60.0 ab	86.7 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL	97.8 a	97.8 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL/SPRING	76.7 ab	96.7 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	0.875	FALL	96.7 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	0.875	FALL/SPRING	91.1 a	93.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
UNTREATED CHECK			0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL	100.0 a	96.7 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL/SPRING	93.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	1	FALL	27.8 bc	97.8 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK	1	FALL/SPRING	90.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	1 2 QT/100 GAL	FALL	93.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
ON DECK HM 8802A	1 2 QT/100 GAL	FALL/SPRING	66.7 ab	93.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
HM 1333 090613-A	0.25 0	FALL/SPRING	81.1 ab	83.3 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a

1- Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT)

Table 7. Percent control of the mouseear chickweed populations following applications of selected herbicides in 2013 and evaluated in 2013 and 2014.

T Treatment	Rate	Timing	(---------Mouseear Chickweed Control[1]----------)					
			(----------2013----------)			(----------2014----------)		
	FL OZ/M		10/7	10/18	11/15	6/6	6/27	8/4
ON DECK	0.75	FALL	66.7 a	62.5 b	66.7 c	8.3 a	16.7 de	45.8 bc
ON DECK	0.75	FALL/SPRING	54.2 a	90.8 a	95.0 a	29.2 a	91.0 a	87.5 a
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL	79.2 a	78.3 ab	79.2 abc	33.3 a	50.0 bcd	60.0 b
ON DECK HM 8802A	0.75 2 QT/100 GAL	FALL/SPRING	75.0 a	83.3 ab	70.8 bc	16.7 a	100.0 a	91.7 a
ON DECK	0.875	FALL	75.0 a	90.8 a	83.3 abc	12.5 a	50.0 bcd	29.2 cd
ON DECK	0.875	FALL/SPRING	66.7 a	83.3 a	86.7 abc	45.8 a	91.7 a	95.0 a
UNTREATED CHECK			0.0 b	4.2 c	4.2 d	0.0 a	4.2 e	4.2 e
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL	70.8 a	90.8 a	91.7 ab	16.7 a	54.2 bc	20.8 de
ON DECK HM 8802A	0.875 2 QT/100 GAL	FALL/SPRING	83.3 a	94.2 a	94.2 a	29.2 a	99.2 a	99.2 a
ON DECK	1	FALL	70.8 a	87.5 a	87.5 abc	45.8 a	37.5 cde	45.8 bc
ON DECK	1	FALL/SPRING	66.7 a	93.3 a	90.8 ab	37.5 a	79.2 ab	85.8 a
ON DECK HM 8802A	1 2 QT/100 GAL	FALL	66.7 a	95.0 a	94.2 a	25.0 a	37.5 cde	41.7 bcd
ON DECK HM 8802A	1 2 QT/100 GAL	FALL/SPRING	75.0 a	79.2 ab	66.7 c	16.7 a	95.8 a	99.2 a
HM 1333 090613-A	0.25 0	FALL/SPRING	70.8 a	82.5 ab	86.7 abc	54.2 a	91.0 a	95.0 a

1- Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT)