

Efficacy of PC Turf herbicide product at different application rates and volumes – 2009 trial.

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MATERIALS/METHODS

Plots were located in turf research area at the Guelph Turfgrass Institute, Guelph, ON. The site is an area of established turf (predominantly turf-type perennial ryegrass, infested with dandelion, clover and other lawn weeds). Turf was maintained with typical high maintenance turf regime: 1.5 kg actual N 100 m⁻² per year in 3 applications (spring, summer, dormant); P and K in a 4:1:4 ratio with N; irrigated to prevent stress prior to treatment application and to prevent dormancy thereafter; mowed at 3 inches.

The treatments were combinations of different rates and volumes of pre-emergent herbicide, as well as controls for a total of 10 treatments (see Table 1). Each treatment was replicated four times in 1 x 2 m plots arranged in a randomized complete block design. Plots were separated by 0.5 m buffer strips (Figure 1). Treatments were applied September 8, 2009. Treatments were applied with a compressed air sprayer.

Data Collection:

Data collected included pre- and post-treatment visual ratings of broadleaf weed cover, point-quadrat weed cover estimates, and post-treatment ratings of phytotoxicity to vegetation in the plots. Phytotoxicity was estimated by visual

ratings and by turf canopy reflectance spectrometry using a Greenseeker normalized difference vegetation index (NDVI) meter.

An anecdotal photographic record of the experiment was kept.

All measurements were analysed by appropriate statistical analyses (general linear models).

RESULTS

Quality ratings and phytotoxicity of treatments. There was slight phytotoxicity and phenoxy herbicide effects apparent in all of the treatments, compared to the control (Table 2). There was very little difference among the herbicide treatments.

Quality/phytotoxicity as estimated by canopy reflectance. The pattern in the canopy reflectance as measured by the normalized-difference vegetation index was significant for all observation dates (Table 3). There was a general decline in NDVI for all treatments relative to the control, but little change in canopy reflectance for the whole experimental area over the season. Within the treated plots, the pattern of canopy reflectance reduction was not consistent, though certain treatments tended to have lower indices (WW1 7.5-60, WW1 2.8-60 and Killlex). It is not possible with this experimental design to separate

Table 1. Treatments

Treatment	rate(gal/acre)	oz/1000	spray volume (gal/acre)
1 WW1 Conc	8	23.2	62
2 WW1 Conc	4	11.6	62
3 WW1 Conc	3	8.7	62
4 WW1 Conc	2	5.8	62
5 WW1 Conc	2	5.8	31
6 WW1 Conc	2	5.8	15.5
7 WW1 Conc	3	8.7	31
8 WW1 Conc	3	8.7	15.5
9 Killlex	0.6		62
10 Control	—	—	—



Figure 1. Plot layout in weedy turf for herbicide trial.

Table 2. Visual ratings of treated plots.

Treatment	Weed rating ¹			Phytotoxicity ²		Phenoxy effect ³	
	0 DAT	9 DAT	36 DAT	1 DAT	3 DAT	1 DAT	3 DAT
WW1 7.5 - 60	5.50	3.50 d	0.75 d	1.3 ab	2.8 a	1.8	2.0 ab
Killex 0.6	5.25	5.00 abc	1.28 cd	0.0 c	1.0 cd	1.5	1.8 ab
WW1 2.8 - 30	5.75	4.25 cd	1.53 cd	1.3 ab	2.5 ab	1.3	2.3 a
WW1 1.9 - 30	5.50	4.50 bcd	1.75 cd	1.0 ab	2.3 ab	1.0	1.5 ab
WW1 1.9 - 15	5.75	5.25 abc	2.00 bcd	1.0 ab	2.3 ab	1.0	1.5 ab
WW1 2.8 - 15	5.25	4.75 abcd	2.00 bcd	1.5 a	2.0 ab	0.8	2.0 ab
WW1 2.8 - 60	5.33	5.67 ab	2.67 bc	1.0 ab	1.7 bc	1.0	1.3 ab
WW1 3.7 - 30	7.00	5.75 ab	3.00 bc	0.8 b	2.0 ab	1.8	2.3 a
WW1 1.9 - 60	5.75	5.25 abc	3.75 ab	0.8 b	0.8 cd	1.3	1.3 b
Control	6.00	6.00 a	5.25 a	0.0 c	0.3 d	0.3	0.3 c
lsd p=0.05	NS	1.40	1.87	0.55	0.92	NS	0.96

¹Visual rating of weed infestation 0-10, 0=no weed, 10=~100% weed cover.

²Visual rating of phytotoxicity 0-10; blackening of leaves of broadleaf weeds or turf.

³Curling of leaves or petioles of broadleaf weeds, rated on a scale of 0-10.

Means of 4 replicates; means within columns followed by the same letter are not significantly different (Fisher's protected LSD, p=0.05).

the effects of loss of broadleaf vegetation cover and phytotoxic effects on the grass species in their effects on NDVI. Both effects would tend to reduce the index.

Broadleaf weed control. The pre-treatment weed cover in the plot area was quite uniform and heavy, with an average visual weed rating of about 5.7 out of 10, and a measured total weed cover of about 34%. The weed community was predominantly dandelion and broadleaf plantain, with smaller amounts of clover and other broadleaf weeds. The treatments produced a significant decrease in total weed cover estimated visually (Table 2). The decrease was relatively

slow to appear, because of the lateness of the treatment application, which meant cool temperature and reduced growth. By 36 DAT all of treatments except WW1 1.9-60 had significantly lower weed ratings than the control. The point quadrat weed cover data showed reasonable weed control (>75% reduction) in the best treatment (WW1 7.6-60), and all treatments had some weed reduction compared to the control (Table 4). There was not a clear trend in either the concentration or the volume effects, and none of the treatments were significantly different than the Killex standard. Most of the weed control was observed in the species that were present in

Table 3. Canopy reflectance readings from treated plots.

Treatment	Days after treatment					
	-11	-6	0	1	2	3
Control	0.543 ab	0.595 ab	0.606 ab	0.607 bc	0.621 a	0.621 bc
WW1 1.9 - 15	0.542 ab	0.601 a	0.613 a	0.628 a	0.611 ab	0.636 a
WW1 1.9 - 30	0.543 ab	0.602 a	0.604 ab	0.628 a	0.614 ab	0.629 ab
Killex 0.6	0.534 abcd	0.598 ab	0.612 a	0.614 ab	0.609 b	0.608 ef
WW1 2.8 - 30	0.545 a	0.597 ab	0.594 bc	0.624 a	0.592 cd	0.621 bcd
WW1 3.7 - 30	0.542 abc	0.598 ab	0.603 ab	0.604 bcd	0.598 c	0.618 bcde
WW1 1.9 - 60	0.524 d	0.581 c	0.585 c	0.590 d	0.589 cd	0.618 cde
WW1 2.8 - 15	0.527 d	0.588 bc	0.594 bc	0.601 bcd	0.586 d	0.604 f
WW1 2.8 - 60	0.530 cd	0.587 bc	0.567 d	0.589 d	0.586 d	0.610 def
WW1 7.5 - 60	0.532 bcd	0.591 abc	0.586 c	0.596 cd	0.564 e	0.606 f
lsd p=0.05	0.0118	0.012	0.0157	0.0149	0.011	0.0111
Treatment	6	7	9	13	16	35
Control	0.614 a	0.617 a	0.619 a	0.654 a	0.632 a	0.625 a
WW1 1.9 - 15	0.570 b	0.567 b	0.564 b	0.615 b	0.566 bc	0.563 c
WW1 1.9 - 30	0.567 bc	0.561 bc	0.564 b	0.608 bc	0.569 b	0.583 b
Killex 0.6	0.568 b	0.566 b	0.550 bc	0.577 f	0.548 de	0.539 e
WW1 2.8 - 30	0.545 d	0.544 de	0.545 c	0.543 ef	0.541 de	0.561 c
WW1 3.7 - 30	0.552 d	0.545 d	0.548 c	0.589 e	0.542 de	0.531 e
WW1 1.9 - 60	0.553 cd	0.548 cd	0.556 bc	0.601 cd	0.553 cd	0.554 cd
WW1 2.8 - 15	0.545 d	0.540 de	0.543 c	0.585 ef	0.550 d	0.556 c
WW1 2.8 - 60	0.541 d	0.530 ef	0.541 c	0.590 de	0.537 e	0.540 e
WW1 7.5 - 60	0.522 e	0.520 f	0.519 d	0.556 g	0.510 f	0.542 de
lsd p=0.05	0.0147	0.015	0.0149	0.0115	0.0136	0.0127

¹Normalized-difference vegetation index. Mean of 70-80 readings x 4 replicates. Treatments are ordered based on overall season mean from highest (Control) to lowest (WW1 7.5 - 60).

Table 4. Percent weed cover estimated by point-quadrat methods in treated plots pre- and post-treatment (28 DAT).

Treatment	Dandelion		Clover		Non-clover legumes		Narrowleaf plantain		Broadleaf plantain	
	pre	post	pre	post	pre	post	pre	post	pre	post
WW1 7.5 - 60	19.3 ¹	5.0 c	6.7	0.3	1.7	0.3 b	0.0	0.0 b	3.0 c	2.3 c
WW1 2.8 - 30	19.0	4.7 c	3.0	0.0	4.0	0.0 b	1.0	0.0 b	5.3 bc	4.7 abc
WW1 1.9 - 30	17.7	8.3 bc	7.7	0.0	0.7	0.0 b	0.0	0.0 b	1.7 c	1.7 c
Killex 0.6	15.3	6.7 c	7.0	2.0	1.7	1.0 b	0.0	0.0 b	4.7 c	4.7 abc
WW1 1.9 - 15	22.3	7.7 bc	4.3	1.0	1.0	1.3 b	0.3	0.3 b	3.3 c	3.3 bc
WW1 2.8 - 15	27.0	11.7 bc	2.3	0.7	2.3	1.7 b	0.0	0.0 b	1.7 c	2.0 c
WW1 3.7 - 30	19.3	7.3 c	0.7	0.3	3.3	1.0 b	2.3	1.3 a	15.3 a	9.0 a
WW1 2.8 - 60	25.3	12.0 bc	1.3	0.0	1.8	1.3 b	0.0	0.0 b	10.7 ab	8.4 ab
WW1 1.9 - 60	24.7	15.0 b	1.0	1.0	3.3	0.3 b	0.0	0.0 b	5.0 c	6.0 abc
Control	21.3	31.0 a	5.3	2.3	5.3	6.7 a	0.0	0.0 b	1.3 c	1.3 c
lsd p=0.05	NS	7.5	NS	NS	NS	2.8	NS	0.8	5.6	5.3
Treatment	Wild carrot		Chickweed		Thistle		Total		Percent reduction	
	pre	post	pre	post	pre	post	pre	post		
WW1 7.5 - 60	1.3	0.0	0.0	0.0	0.0	0.0	32.0	8.0 d	76 a	
WW1 2.8 - 30	0.0	0.0	0.0	0.0	0.0	0.0	32.3	9.3 d	71 ab	
WW1 1.9 - 30	1.3	0.0	0.7	0.0	0.0	0.0	29.7	10.0 cd	68 ab	
Killex 0.6	0.3	0.0	0.0	0.0	0.0	0.0	29.0	14.3 bcd	48 ab	
WW1 1.9 - 15	0.0	0.3	0.7	0.3	0.0	0.0	32.0	14.3 bcd	52 ab	
WW1 2.8 - 15	0.0	0.0	0.0	0.0	0.0	0.0	33.3	16.0 bcd	57 ab	
WW1 3.7 - 30	0.0	0.0	0.7	0.3	0.0	0.0	41.7	19.3 bc	54 ab	
WW1 2.8 - 60	0.4	0.0	0.0	0.0	0.0	0.0	39.6	21.8 b	44 ab	
WW1 1.9 - 60	0.0	0.0	0.0	0.0	0.3	0.0	34.3	22.3 b	34 b	
Control	0.0	0.0	1.0	0.7	0.0	0.0	34.3	42.0 a	-26 c	
lsd p=0.05	NS	NS	NS	NS	NS	NS	NS	9.5	42	

¹Percent cover of weeds estimated by point-quadrat method; 100 points per plot. Means of 4 replicates; means within columns followed by the same letter are not significantly different (Fisher's protected LSD, p=0.05).

appreciable cover percentages (dandelion, and clover), though other weeds were also controlled. The point-quadrat cover data correlated very well with the visual weed ratings (Figure 2).

DISCUSSION AND CONCLUSIONS

All of the experimental treatments reduced the broadleaf weed cover as well as the Killex

standard. The range in weed reduction was quite large, from a low of 34% to a high of 76%. Timing of the treatment application, late in the season, was likely a source of the relatively poor weed control, since the Killex treatments showed less than 50% reduction in weeds. Of the two weed species most common in the treatment area, control seemed to be significantly better for the

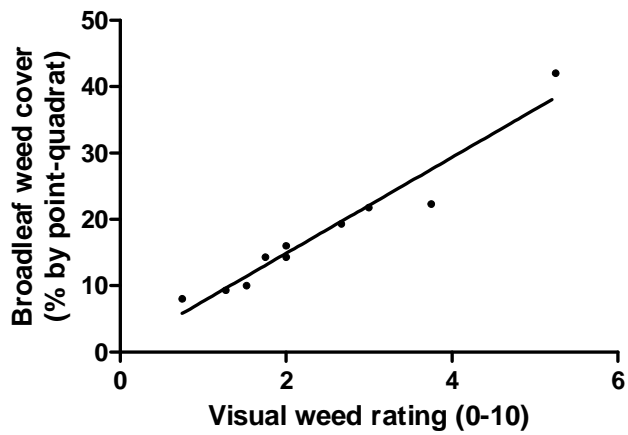


Figure 2. Association between visual weed ratings (36 DAT) and weed cover as assessed by point-quadrat methods (28 DAT). The correlation coefficient for the association is 0.97.

dandelions than for the broadleaf plantain.

There was no significant visible phytotoxicity of any treatments on the grass, though there was some reduction in canopy reflectance, which may indicate general stress to the vegetation in all treatments.

Sponsor: Suncor