Stop #6: Broadleaf Herbicide Safety and Water Use on Kurapia Groundcover

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Objective:

Out of all herbicides registered in California, the most common active ingredients are 2,4-D (264 products), dicamba (246 products), glyphosate (223 products) and MCPP (194 products) (CDPR, 2018). Glyphosate (a non-selective herbicide) aside, usually broadleaf herbicides are formulated in mixes to control a broader spectrum of weeds and most commonly a 3-way mix of 2,4-D, dicamba and MCPP can be found in different proportions. Since the biggest weed management challenge in Kurapia is selectively controlling broadleaf weeds in a broadleaf ground cover, our goal was to test injury and regeneration rate of Kurapia caused by 2,4-D, dicamba, MCPP and MCPA both alone and in mixes.

Materials and Methods:

Four single ingredient herbicides alone and in 2- or 3-way mixes were tested on mature Kurapia established in 2015. Herbicides used were: Weedar 64 (46.8% 2,4-D), Diablo (49.41% Dicamba), MCPP-p (26% MCPP) and MCPA-4 (48.58% MCPA). Treatments were based according to a 3-factor simplex-centroid design with additional interior points and are presented in Table 1. Soil was a Hanford fine sandy loam. Herbicides were tank mixed and applied using a CO_2-powered backpack sprayer with TeeJet 8002VS nozzles calibrated to deliver 1 gal/1000 ft^2. Experimental design was a randomized block with 4 replications. Plot size was 4 ft x 6 ft with 2-ft alleys. Plots were evaluated for flowering (1 [no flowers] – 9 [best flowering]), Visual quality (1 [worst] – 9 [best]) and injury (%). Ratings were done on the day of application and 1 week after treatment (WAT) before publication of this report. Kai Umeda, Area Turfgrass Extension Agent at University of Arizona, is repeating this study in Phoenix.

Results:

Applied herbicides had a significant impact on all measured traits. Almost all herbicides caused complete loss of flowers compared to control within 1 WAT with exception of treatment 3 (Dicamba alone) where still few flowers could be observed. From all treatments applied, 2,4-D alone (treatment 2) had the most significant impact on visual quality drop while for all other treatments no significant differences could be observed. The same treatment also caused the greatest injury, although apart from control, only Dicamba and MCPA (alone and in 2-way mix) had significantly less injury than 2,4-D alone. It is still too early to tell which treatment is most injurious or safest to Kurapia since herbicide effect will most likely differentiate more in time. Results are presented in Table 2.

Acknowledgments:

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References:

CDPR (2018) California Product/Label Database. CDPR. Accessed Sep 1st 2018 https://www.cdpr.ca.gov/docs/label/labelque.htm

Table 1 List of treatments applied in the Kurapia broadleaf herbicide safety study. Riverside, CA. 2018.

	Herbicide (rate)				Active ingredient (rate)				Active ingredient (%)			
Treatment number	**Weedar 64 (oz/A)**	**Diablo (oz/A)**	**MCPP-p (oz/A)**	**MCPA-4 (oz/A)**	**2,4-D (oz/A)**	**Dicamba (oz/A)**	**MCPP (oz/A)**	**MCPA (oz/A)**	**2,4-D**	**Dicamba**	**MCPP**	**MCPA**
1 - Control												
2	43.6				16.9				100%			
3		10.9				4.5				100%		
4			43.6				9.4				100%	
5	21.8	5.4			8.5	2.2			79.1%	20.9%		
6	21.8		21.8		8.5		4.7		64.3%		35.7%	
7		5.4	21.8			2.2	4.7			32.2%	67.8%	
8	14.5	3.6	14.5		5.6	1.5	3.1		55.0%	14.5%	30.5%	
9	29.0	1.8	7.3		11.3	0.7	1.6		83.0%	5.5%	11.5%	
10	7.3	7.3	7.3		2.8	3.0	1.6		38.3%	40.4%	21.3%	
11	7.3	1.8	29.0		2.8	0.7	6.2		28.7%	7.6%	63.7%	
12				43.6				17.3				100%
13	21.8			21.8	8.5			8.6	49.1%			50.9%
14		5.4		21.8		2.2		8.6		20.3%		79.7%
15	14.5	3.6		14.5	5.6	1.5		5.8	43.4%	11.5%		45.1%
16	29.0	1.8		7.3	11.3	0.7		2.9	75.4%	5.0%		19.6%
17	7.3	7.3		7.3	2.8	3.0		2.9	32.3%	34.1%		33.6%
18	7.3	1.8		29.0	2.8	0.7		11.5	18.5%	4.9%		76.7%

Table 2 Effect of herbicides on Flowering, Visual Quality and Injury on Kurapia groundcover. Riverside, CA. 2018.

	Flowering		Visual Quality		Injury (%)	
Treatment	Initial	1 WAT	Initial	1 WAT	Initial	1 WAT
1	7.5 a	6.8 a	7.3 a	7.0 a	0 a	0.00 a
2	5.8 a	1.0 c	6.8 a	5.0 b	0 a	6.50 c
3	7.5 a	2.0 b	7.3 a	6.5 ab	0 a	0.25 ab
4	6.8 a	1.0 c	7.5 a	6.0 ab	0 a	1.50 abc
5	6.0 a	1.0 c	6.5 a	5.5 ab	0 a	3.50 abc
6	7.8 a	1.0 c	7.3 a	5.5 ab	0 a	2.50 abc
7	7.3 a	1.0 c	7.3 a	5.8 ab	0 a	1.00 abc
8	6.8 a	1.0 c	6.8 a	5.8 ab	0 a	2.50 abc
9	6.0 a	1.0 c	7.3 a	5.5 ab	0 a	5.00 abc
10	7.5 a	1.0 c	7.8 a	6.0 ab	0 a	1.00 abc
11	7.8 a	1.0 c	7.8 a	5.8 ab	0 a	2.25 abc
12	6.0 a	1.0 c	7.3 a	6.5 ab	0 a	0.00 a
13	6.0 a	1.0 c	7.0 a	5.5 ab	0 a	5.75 bc
14	8.0 a	1.0 c	7.5 a	6.5 ab	0 a	0.25 ab
15	6.0 a	1.0 c	6.8 a	5.5 ab	0 a	3.75 abc
16	6.5 a	1.0 c	6.8 a	5.8 ab	0 a	2.00 abc
17	6.8 a	1.0 c	7.3 a	5.8 ab	0 a	2.00 abc
18	6.3 a	1.0 c	7.0 a	5.5 ab	0 a	1.75 abc

Means followed by the same letter in a column are not significantly different (*P*=0.05).

Plot plan → N

7	8	8	16	14		12	15	
6	9	4	12	6	2	9	7	3
	10			11	16			18
5	11	15		3	9			8
	12	1		17	12			2
		7	9		5			13
		17	2	13				
			13	15				
4	13	3	10	7			1	
3	14	11	18		1			16
	15	14	5	10				
	16			18		5		6
2	17			4		17	10	11
1	18		6	8		4		14