Comparing the Efficacy of Non-Selective Alternative Herbicides in New Mexico and Western Oregon

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INTRODUCTION

Suppressing weeds in an urban landscape is becoming a challenge for landscape managers who work in areas where pesticide restrictions occur. It is particularly challenging to suppress established vegetation in the absence of traditional herbicides. For example, in Santa Fe, Albuquerque, and Taos, NM, synthetic chemical use on public and municipal lands are only permitted as a last resort after other options have failed. Previously, two field studies took place in California that compared different contact herbicides in a lawn setting that contained both broadleaf and grass plants demonstrating that a quick "burn-down" response was possible, although recovery from treatments occurred (Reiter and Windbiel-Rojas, 2020). With a goal of suppressing all vegetation from an area, more data is needed regarding longevity of suppression from contact herbicides and the number of applications necessary to maintain a vegetation-free site (e.g. mulched or xeriscape landscape systems).

OBJECTIVE

Assess the efficacy of 10 alternative contact herbicides that conform to current and proposed municipal legislation in New Mexico and Oregon to provide better-management information to stakeholders regarding the effectiveness of these products in an urban landscape system.

EXPERIMENTAL DESIGN

Field sites in Las Cruces, NM and Corvallis, OR were chosen. The Las Cruces site consisted of bermudagrass (a warm season grass) mixed with broadleaf weeds, predominantly dandelion, white clover, and sow thistle. The Corvallis site consisted primarily of perennial ryegrass (a cool-season grass) mixed with broadleaf weeds, predominantly white clover and dandelion. Both sites were mown at 7.6 cm at least once a week with clippings removed. Herbicide applications were made using a handheld boom attached to a CO2-powered backpack sprayer with a carrier volume of 814 liters per hectare at 2.0 bars of pressure. Treatments were made every 2 weeks and consisted of the active ingredients and rates listed in **Figure 1**. Digital images were collected with a battery-powered lightbox 3 times a week and presented in **Figure 1** to show changes in vegetation over time. Using the same images, digital gridlines were overlaid onto images, and when grid lines crossed in the image, the plant was identified as either monocot, dicot, or no plant. As a result, changes in monocot and dicot densities over time were calculated by comparing images from the beginning of the study to the end of the study and are presented in **Table 1**. All dependent variables in the experiment in both locations satisfactorily met assumptions of ANOVA and were statistically analyzed using R.

Results

- In mulched or bare-ground xeriscape landscapes, alternative herbicides may provide effective broadleaf weed control; however, repeated applications will be necessary.
- Alternative herbicides may be used to spot spray for broadleaf weeds in turfgrass systems depending on turf type (bermudagrass eventually recovered regardless of treatment).
- Alternative herbicides may be a useful tool for weed control in landscape systems; however, IPM practices are still required for successful and sustainable weed management since both weeds and the turfgrass eventually recovered in both locations regardless of treatment.

Formulation	Change in Monocot density		Change in Dicot Density	
	Corvallis	Las Cruces	Corvallis	Las Cruces
1% clove oil	2% a[$]	52% a[$]	-32% bc[$]	-82% bc[$]
44% caprylic acid, 36% capric acid	-35% b	7% ab	-53% bcd	-78% bc
40% Ammonium nonanoate	-39% bc	5% ab	-26% b	-94% c
70% d-limonene	-20% ab	-3% ab	-52% bcd	-95% c
7.5% sodium chloride	-27% b	-17% ab	-75% cd	-88% bc
22.11% ammoniated soap of fatty acids, 3% maleic hydrazide	-61% c	-9% ab	-39% bcd	-96% c
45% cinnamon oil, 45% clove oil	-18% ab	19% ab	-50% bcd	-90% c
5% mint oil, 5% sodium lauryl sulfate, 5% potassium sorbate	-32% b	33% a	35% a	45% ab
20% acetic acid	-33% b	9% ab	-80% d	-100% c
57% pelargonic acid	-26% b	-49% b	-67% bcd	-97% c
100% water	-31% b	5% ab	38% a	175% a

Table 1: Change in monocot and dicot density in Corvallis, OR from 15 Apr 22 to 10 Jun 22 and in Las Cruces, NM from 26 May 22 to 21 Jun 22. [$]Treatments followed by the same letter are not statistically different at a 0.05 probability using Tukey's HSD.

References

Reiter and Windbiel-Rojas. 2020. Organic herbicides and glyphosate for weed control: results of coordinated experiments in urban landscapes. CAPCA Advisor. California Association of Pest Control Advisors. Accessed online: 22 Feb 2023. https://issuu.com/capcaadviser/docs/202002_capca_adv_feb2020_web/24

Active Ingredients	Application Rate	Product cost per hectare (Feb 2023)
1% Clove oil	33% v/v	$3,552.08
44% Caprylic + 36% capric acid	6% v/v	$1,717.92
40% Ammonium nonanoate	13% v/v	$2,013.60
70% D-limonene	25% v/v	$6,671.46
7.5 % Sodium chloride	100% v/v	$5,801.74
22% Ammoniated soap of fatty acids + 3% maleic hydrazide	17% v/v	$3,511.87
45% Cinnamon oil + 45% clove oil	5% v/v	$1,533.85
5% Mint oil + 5% sodium lauryl sulfate + 5% potassium sorbate	6% v/v	$697.50
20% Acetic acid	100% v/v	$6,025.63
57% Pelargonic acid	10% v/v	$1,616.31
100% Water	100% v/v	$0.00

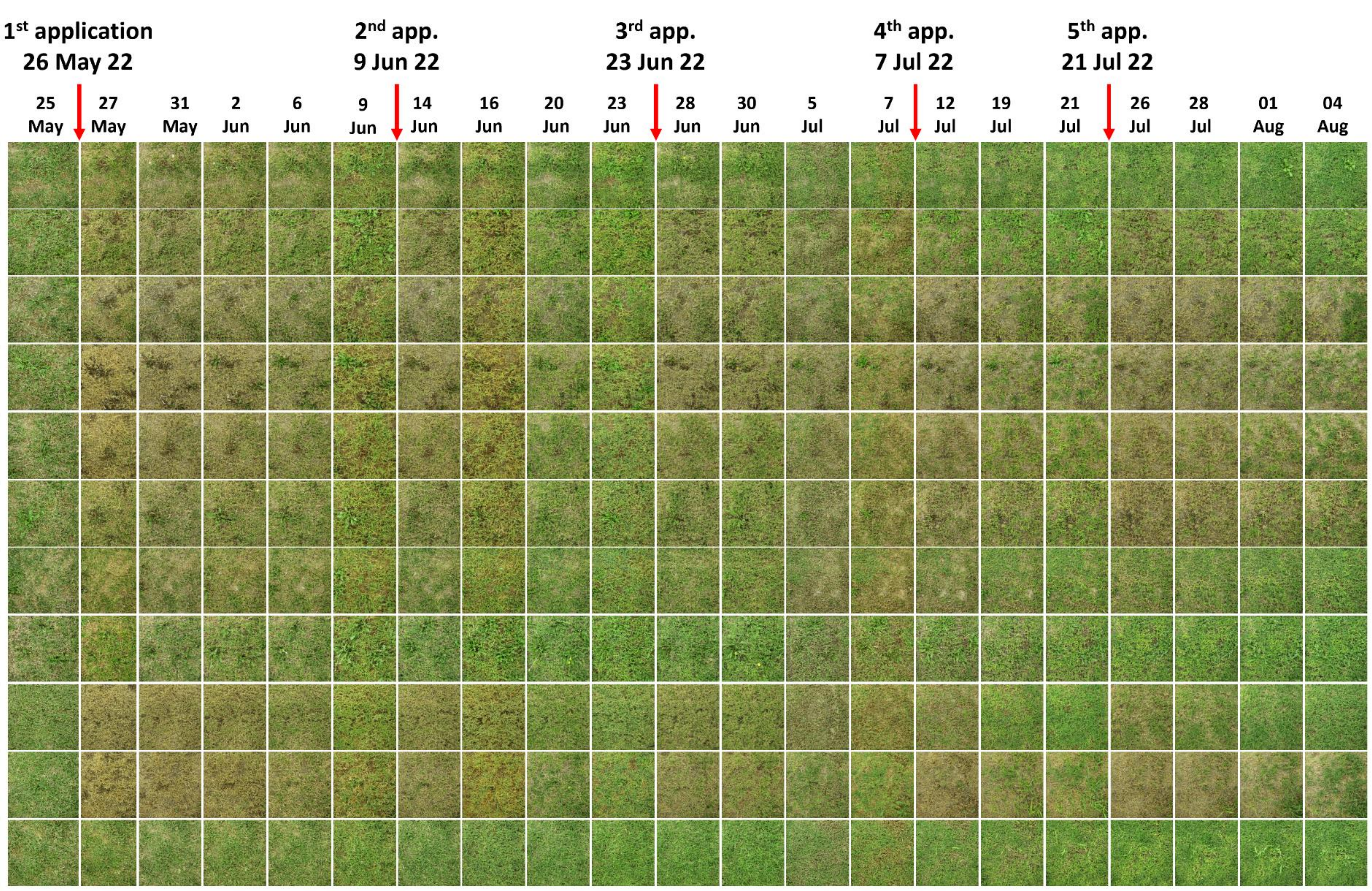

Figure 1: Images of plots representative of non-selective herbicide treatment effects over time on a mixed stand of grasses and broadleaves in Las Cruces, NM. Treatments began 26 May 22 and were applied every 2 weeks through 21 Jun 22. Additional images taken up to two weeks after initial application (04 Aug. 22) to show recovery from treatment applications.