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UW – Madison Weed Science Renz Lab

Effectiveness of TerraVue on Box Elder

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Objective:

Evaluate the effectiveness of florpyrauxifen (TerraVue) alone or when mixed with other products in controlling box elder and if adding gibberellic acid can improve control.

Summary:

Box elder is a common woody weed in many grassland systems. It can be challenging to control with herbicides as uptake into the woody tissue is minimized by early leaf drop. Including florpyrauxifen with other active ingredients may improve control, and the addition of gibberellic acid could also low leaf drop allowing for more herbicide uptake and improved control. Experiments were established and treated in August of 2023. All treatments with herbicides showed high levels of foliar injury 20 days after treatment (DAT). The gibberellic acid treatment alone had no significant injury (9%) compared to nontreated plants. While differences in control were observed 20 DAT all herbicides provided > 75% control.

One year after application (332 DAT) all herbicide treatments had high control (>90%) of box elder and did not differ among treatments. Resprouting was observed with two treatments (TerraVue+Vastlan+Escort WG and TerraVue +Vastlan+ SiteVue VM) but it was not different than other treatments which had no resprouting. Two years after application (639 DAT) all herbicide treatments controlled box elder (>95 % control), with only one herbicide treatment (TerraVue+Vastlan+Escort WG) showing reduced control (95%). Mortality was high for all treatments (>86%) at this time, with only the treatments TerraVue+Vastlan+Arsenal and TerraVue+Vastlan+Escort WG having any surviving trees.

Results demonstrate that foliar applications of TerraVue are effective at controlling box elder alone or in tank mixtures. High levels of efficacy may be due to the size of box elder shrubs (3-6 ft tall with 1-2 stems). Control may be reduced with larger trees.

Notes

During application, treatment 2 had not been agitated enough until the third rep and rep 6 for treatment 5 was also accidentally missed during application. Due to this, these replications were not used during statistical analysis of data taken for this trial.

Herbicide Treatments

Treatment Number	Treatment	Rate
1	Milestone	0.33 % v/v
2	TerraVue	0.18 oz wt/gal
3	TerraVue Vastlan	0.18 oz wt/gal 2 % v/v
4	TerraVue Vastlan Arsenal	0.18 oz wt/gal 2 % v/v 0.1 % v/v
5	TerraVue Vastlan Escort WG	0.18 oz wt/gal 2 % v/v 0.04 oz wt/gal
6	TerraVue Vastlan SiteVue VM	0.18 oz wt/gal 2 % v/v 0.5 % v/v
7	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal
8	TerraVue Vastlan *Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal
9	Gibberellic Acid	37.85 g/gal
10	Nontreated Control (NTC)	-

All treatments, except treatment 9, include MSO at a rate of 1 % v/v.

Treatments 9 (Gibberellic Acid @ 37.85 g/gal) and 10 (nontreated control) only had four replications.

*Gibberellic Acid in treatment 8 was applied 25 hours before other herbicides.**

Herbicide Application		
Application Timing	A	B
Date	August 23, 2022 10:20 am – 10:30 am	August 24, 2022 11:10 am – 12:40 pm
Equipment	CO_2 single nozzle sprayer (50 GPA)	
Nozzles & spacing	One TeeJet 8002 nozzle	
Regulator PSI	44	44

Weather Data		
Application Timing	A	B
Weather Station	KWIMADIS233	
Temperature	83.6°F	77.4°F – 89.1°F
Wind Speed and Direction	2.3 mph NNW	1.5 mph SSW
Relative Humidity	50%	48%
Cloud Cover	5%	30 %
Previous Rain Event Within 48 Hours	none	none
When ≥ 0.25 inches of precipitation occurred after treatment	August 25, 2022 – 1.98 inches	August 25, 2022 – 1.98 inches

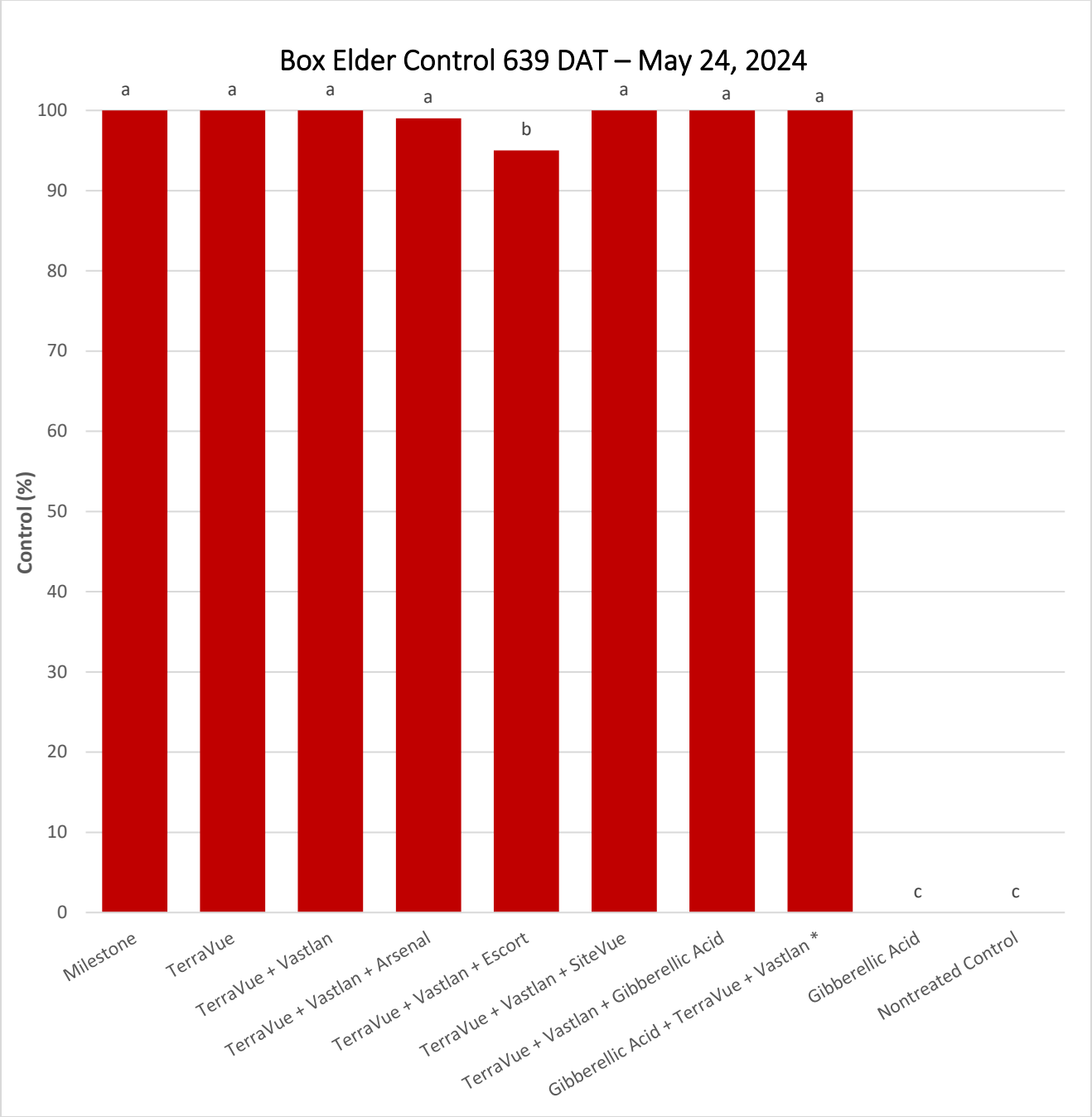
Research Plot Information	
Plot Dimensions	Single Tree
Design	Randomized Complete Block, 8 blocks
Soil Type	Colwood silt loam
Soil Characteristics	18.9 % clay, 1.26 % organic matter, 7.6 pH, 1 % slope

Plants Present at Application – Developmental Stage		
Species	**Average Height (in)**	**Phenological Stage**
Box Elder (*Acer negundo)*	5 feet	Vegetative (leafed out)

Box Elder 331 DAT (July 21, 2023) that was left untreated. No injury is visible.

Box Elder 331 DAT (July 21, 2023) that has been sprayed with TerraVue 0.18 oz wt/gal + Vastlan 2 % v/v and provided 100% control. Box elder shown in white circle. Note bareground around tree showing non-target damage to species.

Index of Ratings and Results



Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

*Gibberellic Acid sprayed 25 hours before remaining herbicides

Results:

Pre-treatment rating – July 6, 2022				
Trt. No.	**Treatment**	**Rate**	**Box Elder Height Category (1-3)[1]**	**Box Elder Stem Type Category (1-2)[2]**
1	Milestone	0.33 % v/v	2 ab	1.8 -
2	TerraVue	0.18 oz wt/gal	1.8 b	1.8 -
3	TerraVue Vastlan	0.18 oz wt/gal 2 % v/v	2.1 a	2 -
4	TerraVue Vastlan Arsenal	0.18 oz wt/gal 2 % v/v 0.1 % v/v	1.8 b	1.8 -
5	TerraVue Vastlan Escort WG	0.18 oz wt/gal 2 % v/v 0.04 oz wt/gal	2.1 a	2 -
6	TerraVue Vastlan SiteVue VM	0.18 oz wt/gal 2 % v/v 0.5 % v/v	2 ab	2 -
7	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	2 ab	1.9 -
8	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	1.6 b	1.8 -
9	Gibberellic Acid*	37.85 g/gal	2.3 a	2 -
10	NTC*	-	2 ab	2 -
Statistics [3]				
Least Significant Difference (LSD) P=.05			0.33	0.33
Standard Deviation			0.33	0.33
Coefficient of Variation (CV)			17.12	17.39
Treatment Prob(F)			0.0221	0.4170

Note: Means followed by same letter or symbol do not significantly differ

[1] For box elder heights a scale of 1-3 was used, with 1 being for plants 1-3 ft tall, 2 being 3-6 ft and 3 being taller than 6 ft.

[2] Box elder was split into two stem types: single and multi. A scale of 1-2 was used with 1 being for single stem and 2 for multi-stem

* Treatments only included four replications.

[3] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

22 Days after Treatment (DAT) – September 15, 2022				
Trt. No.	**Treatment**	**Rate**	**Box Elder foliar Injury (%)**	**Box Elder Control (%)**
1	Milestone	0.33 % v/v	96 a	79 ab
2	TerraVue	0.18 oz wt/gal	96 a	75 c
3	TerraVue Vastlan	0.18 oz wt/gal 2 % v/v	99 a	83 a
4	TerraVue Vastlan Arsenal	0.18 oz wt/gal 2 % v/v 0.1 % v/v	99 a	80 a
5	TerraVue Vastlan Escort WG	0.18 oz wt/gal 2 % v/v 0.04 oz wt/gal	97 a	77 bc
6	TerraVue Vastlan SiteVue VM	0.18 oz wt/gal 2 % v/v 0.5 % v/v	99 a	84 a
7	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	99 a	81 ab
8	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	99 a	82 ab
9	Gibberellic Acid*	37.85 g/gal	9 b	1 d
10	NTC*	-	0 c	0 d
Statistics[4]				
LSD P=.05			3.64	5.17
Standard Deviation			3.63	5.15
CV			4.16	7.25
Treatment Prob(F)			0.0001	0.0001

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[4] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

* Treatments only included four replications.

331 DAT – July 21, 2023					
Trt. No.	Treatment	Rate	Mortality (%)	Box Elder Resprouts (#)	Box Elder Control (%)
1	Milestone	0.33 % v/v	100 a	0 -	100 a
2	TerraVue	0.18 oz wt/gal	100 a	0 -	100 a
3	TerraVue Vastlan	0.18 oz wt/gal 2 % v/v	100 a	0 -	100 a
4	TerraVue Vastlan Arsenal	0.18 oz wt/gal 2 % v/v 0.1 % v/v	100 a	0 -	100 a
5	TerraVue Vastlan Escort WG	0.18 oz wt/gal 2 % v/v 0.04 oz wt/gal	90 a	0.4 -	92.9 a
6	TerraVue Vastlan SiteVue VM	0.18 oz wt/gal 2 % v/v 0.5 % v/v	90 a	0.4 -	95 a
7	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	100 a	0 -	100 a
8	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	100 a	0 -	100 a
9	Gibberellic Acid*	37.85 g/gal	0 b	n/a +	0 b
10	NTC*	-	0 b	n/a +	0 b
Statistics[5]					
LSD P=.05			0.17	0.55	7.86
Standard Deviation			0.17	0.55	7.83
CV			119.6	557.96	8.99
Treatment Prob(F)			0.0001	0.5421	0.0001

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

* Treatments only included four replications.

+ Treatments were removed for analysis due to lack of injury on trees.

[5] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

631 DAT – May 16, 2024				
Trt. No.	**Treatment**	**Rate**	**Mortality (%)**	**Box Elder Control (%)**
1	Milestone	0.33 % v/v	100 a	100 a
2	TerraVue	0.18 oz wt/gal	100 a	100 a
3	TerraVue Vastlan	0.18 oz wt/gal 2 % v/v	100 a	100 a
4	TerraVue Vastlan Arsenal	0.18 oz wt/gal 2 % v/v 0.1 % v/v	88 a	99 a
5	TerraVue Vastlan Escort WG	0.18 oz wt/gal 2 % v/v 0.04 oz wt/gal	86 a	95 b
6	TerraVue Vastlan SiteVue VM	0.18 oz wt/gal 2 % v/v 0.5 % v/v	100 a	100 a
7	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	100 a	100 a
8	TerraVue Vastlan Gibberellic Acid	0.18 oz wt/gal 2 % v/v 37.85 g/gal	100 a	100 a
9	Gibberellic Acid*	37.85 g/gal	0 b	0 c
10	NTC*	-	0 b	0 c
Statistics[6]				
LSD P=.05			17.53	4.33
Standard Deviation			17.47	4.32
CV			22.6	5.44
Treatment Prob(F)			0.0001	0.0001

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

* Treatments only included four replications.

[6] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.