

# Efficacy of Current Organic Postemergent Weed Control Options in Turfgrass Systems

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**SUMMARY:** A common question from lawn care companies and homeowners is “What organic herbicides or non-pesticide products are available for weed control?” An organic herbicide is one that can be used in USDA Organic farming. There are few organic herbicides available in turf. The objectives of this experiment were to determine the efficacy of various organic control products on common weed species, and also to determine the herbicide injury caused by various organic control products on Kentucky bluegrass. Turf injury was highest for the flame thrower treatment applied on 20 Oct 2010 although turf had completely recovered by 15 April 2011 the following spring. Scythe, Organic Weed & Grass Killer, BurnOut Weed & Grass Killer, octanoic acid, octanoic acid + clove oil, and clove oil all also caused unacceptable injury to Kentucky bluegrass in the initial weeks after application. No product provided ground ivy control. Dandelion coverage varied by treatment ( $P=0.07$ ) with the Ortho Weed-Be-Gon (RTU) reducing dandelion coverage to 1% the following spring with organic herbicides not providing any appreciable control. Weed control without pesticides remains difficult in turfgrass systems due to undesirable turf injury and low efficacy of organic products. Homeowners wishing to control weeds with organic products need to make multiple spot treatments for improved control and be accepting of some turf injury.

A common question from lawn care companies and homeowners is “What organic herbicides or non-pesticide products are available for weed control?” An organic herbicide is one that can be used in USDA Organic farming. There are few organic herbicides available in turf. Corn gluten meal is the predominant organic herbicide used in turfgrass systems for preemergence control of crabgrass. This product has shown to be effective in northern states in lawns due to improvements in turf density from the nitrogen fertilization provided from this product although testing in Indiana and states south of Indiana often show limited or no efficacy of this product for preemergence crabgrass control.

**ADDITIONAL INDEX WORDS:**

2-phenethyl propionate; Caprylic acid; cinnamon bark; citrus oil; d-limonene; eugenol; Iron HEDTA; octanoic acid; Pelargonic acid; potassium salts of fatty acids; sodium lauryl sulfate; vinegar.

Among the postemergence organic herbicides, Scythe (pelargonic acid) and acetic acid (5% or greater solutions) are the most common. Other medium-length fatty acids and clove oil (eugenol) show some promise; however, these organic postemergence herbicides are non-selective and injurious to actively growing turfgrasses in any method other than for directed spot treatments to weeds. Thus, these organic postemergence herbicides often have limited use in turf other than for weed control in parking lots, fence rows, and other bare ground applications or they require applications as spot treatments to the weed to limit injury to the turf. Despite some information on the efficacy of organic weed control options, there are very few published research studies on their efficacy, especially on some over-the-counter products and homeowner “concoctions”. The objectives of this experiment were to determine the efficacy of various organic control products on common weed species, and also to determine the herbicide injury caused by various organic control products on Kentucky bluegrass.

### MATERIALS AND METHODS

The experiment was conducted at the W.H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN. The area was a Kentucky bluegrass blend and had a history of ground ivy and dandelion pressure. Experimental design was a randomized complete block with three replications and an individual plot size of 11 ft<sup>2</sup>. Plots were treated with herbicides (Table 1) on 20 Oct 2010. Herbicides were applied in 75 gpa water with a CO<sub>2</sub>-pressurized sprayer at 30 psi. Plots were visually rated for ground ivy and dandelion coverage, and injury to Kentucky bluegrass. Injury was rated on a 9 to 1 scale with 9 = no injury, 7 = acceptable injury, and 1 = totally brown turf. All data were analyzed using SAS (SAS Institute, Inc). Means separated using Fisher's protected least significant difference when F tests were significant at  $\alpha=0.05$ .

### RESULTS AND DISCUSSION

Turf injury was highest for the flame thrower treatment applied on 20 Oct 2010 although turf had completely recovered by 15 April 2011 the following spring (Table 2). Scythe, Organic Weed & Grass Killer, BurnOut Weed & Grass Killer, octanoic acid, octanoic acid + clove oil, and clove oil all also caused unacceptable injury to Kentucky bluegrass in the initial weeks after application (Table 2).

Ground ivy coverage was reduced initially by Scythe, EcoSmart, Organic Weed & Grass Killer, BurnOut Weed & Grass Killer, clove oil, octanoic acid + clove oil, flame thrower, and the mechanical weed control treatments (Table 3). However, this control was short lived as all treatments were similar to the untreated control in the spring following fall applications including the Ortho Weed-B-Gon treatment which served as the homeowner standard in this experiment. It is worth noting that herbicides containing triclopyr such as Ortho Weed-B-Gon Chickweed, Clover, Oxalis Killer would be a better choice for ground ivy control. Dandelion coverage varied by treatment ( $P=0.07$ ) with the Ortho Weed-Be-Gon (RTU) providing the most dandelion control the following spring.

Weed control without pesticides remains difficult in turfgrass systems due to undesirable turf injury and low efficacy of organic products. Homeowners wishing to control weeds with "organic" products need to make multiple spot treatments for improved control and be accepting of some turf injury. In

this experiment, we made only one application but control would be improved with repeated applications (two in fall at a one-month interval and as needed in the spring). Ortho Ecosense Lawn Weed Killer and other herbicides containing FeHEDTA have received the most attention recently because they are less injurious than other organic herbicides, but FeHEDTA did not provide any weed control in this experiment. Ideally, an organic herbicide would provide effective control of weed species without being harmful to the desirable turfgrass species. Unfortunately, this research did not identify such a product.

**Table 1.** Product description of organic weed control options used in this experiment.

Product	Rate	Information
Scythe	7% v/v	Pelargonic acid
Ortho Ecosense Lawn Weed Killer	RTU	Iron HEDTA (FeHEDTA)
EcoSmart 64oz	RTU	Contains 2-phenethyl propionate, eugenol, and sodium lauryl sulfate as active ingredients
Fast Acting Weed and Grass Killer	RTU	Contains potassium salts of fatty acids as active ingredient. <a href="http://www.planetnatural.com">www.planetnatural.com</a>
Organic Crabgrass Killer	2 lb/100 ft <sup>2</sup>	Contains cinnamon bark as active ingredient. <a href="http://www.planetnatural.com">www.planetnatural.com</a>
Organic Weed & Grass Killer	1:4 Prod:H <sub>2</sub> O	Contains citrus oil (d-limonene) as active ingredient. <a href="http://www.planetnatural.com">www.planetnatural.com</a>
BurnOut Weed & Grass Killer	1:2 Prod:H <sub>2</sub> O	Contains citric acid, clove oil, and sodium lauryl sulfate as active ingredients. <a href="http://www.planetnatural.com">www.planetnatural.com</a>
Octanoic acid	1.8 gal/A	Caprylic acid, eight-carbon saturated fatty acid, also known as octanoic acid
Clove Oil	3.21 gal/A	100% pure purchased from NOW Foods, Item# NWF467, 4 fl oz. Eugenol is the main component in the essential oil extracted from cloves, comprising 72–90% of the total.
Octanoic Acid + Clove Oil	1.8 gal/A + 1.07 gal/A	Description above
Vinegar Cocktail	RTU	To 1 gallon of 10% vinegar, add 1 ounce of orange/citrus oil (d-limonene), 1 teaspoon of liquid soap, 1 tablespoon of molasses. This was a home remedy recommended by some. Although there are many variations of this, these components are recommended in many home weed killer concoctions. Orange oil purchased from <a href="http://citrusdepot.net">citrusdepot.net</a> .
Flame Thrower		Weed dragon home and garden torch kit.
Mechanical weed Control		Weeds removed by pulling and cutting with a knife.
Ortho Weed-Be-Gon	RTU	2,4-D + mecoprop (MCP) + dicamba
Untreated check		

**Table 2.** Herbicide injury to Kentucky bluegrass from organic weed control options.

Treatment	rate	Injury				
		22 Oct	25 Oct	5 Nov	17 Nov	15 April
Scythe	7% v/v	6.3 b <sup>a</sup>	4.0 f	4.6 e	6.6 d	9
Ortho Ecosense Lawn Weed Killer	RTU	9.0 a	9.0 a	9.0 a	9.0 a	9
EcoSmart 64oz	RTU	8.7 a	7.0 bcd	7.3 bc	8.3 abc	9
Fast Acting Weed and Grass Killer	RTU	8.3 a	8.3 ab	7.3 bc	8.7 ab	9
Organic Crabgrass Killer	2 lb/100 ft <sup>2</sup>	9.0 a	9.0 a	8.3 ab	9.0 a	9
Organic Weed & Grass Killer	1:4 Prod:H <sub>2</sub> O	8.0 a	4.7 ef	5.3 de	7.0 cd	9
BurnOut Weed & Grass Killer	1:2 Prod:H <sub>2</sub> O	8.3 a	6.3 d	6.3 cd	8.3 abc	9
Octanoic acid	1.8 gal/A	8.0 a	5.6 de	5.7 de	7.7 abcd	9
Clove Oil	3.21 gal/A	9.0 a	8.0 abc	6.3 cd	8.3 abc	9
Octanoic Acid	1.8 gal/A	8.0 a	4.3 ef	5.3 de	7.3 bcd	9
+ Clove Oil	1.07 gal/A					
Vinegar Cocktail	RTU	8.0 a	6.7 cd	6.7 cd	7.7 abcd	9
Flame Thrower		1.0 c	1.0 g	2.3 f	3.3 e	9
Mechanical weed Control		9.0 a	9.0 a	8.7 ab	8.7 ab	9
Ortho Weed-Be-Gone	RTU	9.0 a	8.7 a	8.7 ab	8.7 ab	9
Untreated		9.0 a	8.7 a	8.7 ab	9.0 a	9
P-value		<0.0001	<0.0001	<0.0001	<0.0001	NS

<sup>a</sup> Within columns, means followed by the same letter are similar.

**Table 3.** Organic herbicide effects on ground ivy coverage.

Treatment	rate	Ground ivy coverage			
		17 Nov	15 April	29 April	3 June
		%			
Scythe	7% v/v	18 fg	12	25	68
Ortho Ecosense Lawn Weed Killer	RTU	83 ab	11	32	72
EcoSmart 64oz	RTU	72 bc	20	37	70
Fast Acting Weed and Grass Killer	RTU	90 ab	7	32	77
Organic Crabgrass Killer	2 lb/100 ft <sup>2</sup>	78 ab	18	43	63
Organic Weed & Grass Killer	1:4 Prod:H <sub>2</sub> O	58 cd	4	30	73
BurnOut Weed & Grass Killer	1:2 Prod:H <sub>2</sub> O	38 e	9	20	65
Octanoic acid	1.8 gal/A	77 ab	6	28	77
Clove Oil	3.21 gal/A	43 de	14	35	67
Octanoic Acid	1.8 gal/A	33 ef	4	13	62
+ Clove Oil	1.07 gal/A				
Vinegar Cocktail	RTU	83 ab	12	32	77
Flame Thrower		1 g	5	23	70
Mechanical weed Control		13 g	9	30	68
Ortho Weed-Be-Gon	RTU	92 a	9	33	67
Untreated		93 a	20	38	70
P-value		<0.0001	NS	NS	NS

**Table 4.** Organic herbicide effects on dandelion coverage.

Treatment	Dandelion coverage	
	rate	15 April
		%
Scythe	7% v/v	8
Ortho Ecosense Lawn Weed Killer	RTU	14
EcoSmart 64oz	RTU	18
Fast Acting Weed and Grass Killer	RTU	20
Organic Crabgrass Killer	2 lb/100 ft <sup>2</sup>	18
Organic Weed & Grass Killer	1:4 Prod:H <sub>2</sub> O	7
BurnOut Weed & Grass Killer	1:2 Prod:H <sub>2</sub> O	23
Octanoic acid	1.8 gal/A	10
Clove Oil	3.21 gal/A	23
Octanoic Acid	1.8 gal/A	28
+ Clove Oil	1.07 gal/A	
Vinegar Cocktail	RTU	13
Flame Thrower		30
Mechanical weed Control		18
Ortho Weed-Be-Gon	RTU	1
Untreated		10
P-value		0.07