

Using Acetic Acid (Vinegar) As A Broad-Spectrum Herbicide

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Introduction

Professionals in the field of horticulture as well as home gardeners constantly ask Cooperative Extension Educators about alternatives to pesticides for turfgrass management. A specific interest is in alternatives for the broad-spectrum herbicides, such as glyphosate (sold as "RoundUp" or other trade names). Broad-spectrum herbicides are used in a variety of turfgrass and landscape renovation projects, such as the removal of an existing lawn area to install new sod or seed, the removal of a lawn for other landscaping projects, or general weed management in paved and graveled areas. While a new lawn or garden bed can be managed without pesticides, a broad-spectrum herbicide is generally needed to create a new bed or lawn, since the other alternatives (i.e., stripping the existing sod with a sod cutter, rototilling the existing sod into the soil, etc.) are often not practical or desirable.

Recently, a great deal of interest has been expressed in the use of acetic acid (vinegar) as a broad-spectrum herbicide. While many anecdotal reports of success with vinegar have been published in the popular press and on the internet, research to substantiate these claims is limited. This project evaluated the broad-spectrum herbicidal activity of two new acetic acid type herbicides, two "home-made" treatments of acetic acid, and a traditional herbicide.

The treatments and manufacturers are listed below.

Treatment name and active ingredient	Manufacturer
Nature's Glory Weed and Grass Killer (25% acetic acid)	Monterey Lawn and Garden Products
BurnOut Weed and Grass Killer (25% acetic acid)	St. Gabriel Laboratories
5% acetic acid*	Mallinckrodt, Inc.
20% acetic acid	See above
RoundUp (glyphosate)	Monsanto, Inc.
Check (unsprayed plots)	

* Vinegar off the store shelf is approximately 5% acetic acid

The study was conducted in August, 2001, on a partially irrigated home lawn in Castleton, NY. Applications for each product were made either once (at 0 days) or three times (at 0, 7 and 14 days), except for glyphosate, which was applied only once. Plant populations in the plots included quackgrass, crabgrass, ground ivy, dandelion, broadleaf plantain, and Kentucky bluegrass. All treatments were evaluated at 24 hours and one week after each application, then periodically thereafter. A 0 - 100% visual rating scale was used, with 0 appearing like the check plots (no injury) and 100% appearing as total injury. Since prolonged warm fall weather encouraged plant growth, observations were continued until October 31 (13 weeks).

Results and discussion

INITIAL DAMAGE

All acetic acid treatments quickly caused a dramatic discoloration and browning of foliage on all plant species. In a few hours, the foliage became blackened and water-soaked. No twisting or yellowing was seen for any treatment or species. After 24 hours, control in all plots with an acetic acid product was 95 to 100%.

PLOTS SPRAYED WITH ONE APPLICATION

Nature's Glory and BurnOut performed in a similar manner, giving an average control for all replicates well above 90% after 24 hours and at two weeks. At five weeks, good control was still seen except for one plot where aggressive Kentucky bluegrass re-grew. At nine weeks and beyond, control was significant only on ground ivy. The 20% acetic acid performed slightly better than the commercial products, maintaining an average control of 92.7% at five weeks, and 76% at nine weeks. The 5% acetic acid treatment showed good control for only two to five weeks, making it much less favorable than the treatments of higher concentration. Glyphosate, as expected, provided 90% or better control from two weeks to 13 weeks.

Average percent control for selected dates for plots sprayed with one application

	24 Hours	2 Weeks	5 Weeks	9 Weeks	13 Weeks
Nature's Glory	96.0	94.7	86.7	48.3	43.3
BurnOut	96.7	97.7	81.7	53.3	36.7
5% Acetic Acid	93.3	74.7	46.7	33.3	33.3
20% Acetic Acid	98.3	96.0	92.7	76.0	66.0
Glyphosate	53.3	97.7	99.3	96.7	95.0

PLOTS SPRAYED WITH THREE APPLICATIONS

Nature's Glory and BurnOut again performed in a similar manner, showing control at 90% or above for at least five weeks. By nine weeks, Kentucky bluegrass and quackgrass began to re-grow, and average control slipped to just above 80%. After 13 weeks, good control (90% or above) was seen only on ground ivy. The 20% acetic acid treatments again showed slightly better control than the commercial products, with an average control of better than 90% maintained to nine weeks, and average of 81% after 13 weeks. The 5% acetic acid treatment showed surprisingly good control of 90% or better to five weeks, but proved much less effective at nine and 13 weeks.

Average percent control for selected dates for plots sprayed with three applications

	24 Hours	2 Weeks	5 Weeks	9 Weeks	13 Weeks
Nature's Glory	96.7	99.3	97.7	81.0	53.3
BurnOut	96.7	99.3	96.7	84.3	65.0
5% Acetic Acid	90.0	98.7	95.0	64.3	56.0
20% Acetic Acid	98.3	99.3	98.7	91.7	81.0
Glyphosate	53.3	97.7	99.3	96.7	95.0

Conclusions

All treatments of acetic acid provided excellent control of crabgrass and broadleaf plantain, two annual weeds, with virtually no re-growth of these species during the thirteen weeks. If this experiment was conducted earlier in the growing season, or under less droughty conditions, it is not known whether re-growth or new seedling germination would have occurred. Ground ivy appears to be very susceptible to acetic acid. Virtually all treatments provided excellent initial and long-lasting control of this often difficult-to-manage species. Although all of the acetic acid treatments did a good job of initially controlling quackgrass (which has a very aggressive root system), it re-grew by the 9 week observation date for many treatments. By thirteen weeks, the percentage of quackgrass for many treatments actually increased beyond what was initially seen in the plots!

This study showed that acetic acid is useful herbicide. Acetic acid at 5% concentration (as would be found on the supermarket shelf) provided only short-term control of most perennial weeds, but did effectively control crabgrass and plantain. Three applications of acetic acid were seen to be much more effective than one application in most cases. Pesticide applicators and gardeners following the advice of various gardening media who suggest vinegar as an herbicide should be aware that repeated applications may be necessary. The highest concentration of acetic acid (20%) and the commercial formulations provided some good control, but were not as effective as glyphosate. Possible ways to improve the performance of acetic acid will be examined in future studies. Although the plots where this study was conducted were irrigated, overall droughty conditions during the summer of 2001 may have influenced herbicide performance, making it desirable to repeat this work under conditions of "normal" rainfall and earlier in the year.

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