English Ivy (*Hedera helix*) Control with Selected Postemergence Herbicides©

Qian Yang, Charles H. Gilliam and Jeff L. Sibley
Department of Horticulture, Auburn University, Auburn, Alabama, 36849, USA
Email: qzy0002@auburn.edu; gillic1@auburn.edu

Glenn R. Wehtje and J. Scott McElroy
Department of Agronomy and Soil Science, Auburn University, Auburn, Alabama, 36849, USA

English ivy (*Hedera helix* L.) is an aggressive vine that has invaded at least 28 states of the United States. Current research indicates limited control with older herbicides. More potential herbicides were registered in the 2000s. Container study was conducted to evaluate English ivy response to older herbicides and newly registered postemergence herbicides in a series of application rates. Metsulfuron at the highest rate evaluated (0.35 kg·ha^{-1}) was the most effective. Metsulfuron at rates above 0.21 kg·ha^{-1} provided control ratings ≥9.1 and fresh weight reduction ≥97% at 42 DAT. Maximum efficacy with glyphosate was obtained with 8.63 kg·ha^{-1} (69%). Treatments with fluroxypyr, 2,4-D and aminopyralid were ineffective: no fresh weight reduction was over 50% compared to non-treated control.

INTRODUCTION

English ivy (*Hedera helix* L.) is a native species in Europe, Western Asia and Northern Africa, which was introduced into North America in the colonial era (Wyman, 1994; Randall, 1996). English ivy is an evergreen vine growing from full sun to deep shade (Gilman, 1999), which is widely used in ornamental landscape, and considered a good ground cover species in the Great Plains and Midwest (Beck et al., 2008). However, many native species have been impacted by invasive species (Reichard and White, 2001). English ivy vines aggressively climb up tree trunks (30 feet per year) and spread into the canopy, which may result in the host tree death in a few years (Soll, 2005). This species has invaded Southern, mid-Atlantic and Pacific Northwest forestry areas in the United States (Randall, 1996; Miller, 2007). From the report of USDA-NRCS (2002), English ivy is present in 28 states.

One method to control English ivy is to pull up the plant by hand (Biggerstaff and Christophen, 2007). This way was effective and environmentally safe for native species recovery. However, manual pulling costs ranged from $2,000 to $8,000 per acre at minimum wage, and may also cause soil surface erosion and other weed species invasion. (Soll, 2005). Comparably, chemical control cost ranged $100-$500 per acre assuming $25-$100 per hour for operator cost and $50 per gallon for chemical (Soll, 2005). A study done in 1985 on glyphosate application on selected woody ornamentals showed glyphosate applied at 3.0 kg·ha^{-1} in March controlled English Ivy 98% at 25 days after treatment; while June application control 82% at 3.0 kg·ha^{-1}; August to September application controlled 55% (Neal and Skroch, 1985). Neal (1998) emphasized that the best control of English ivy was obtained by applying 2% or 3% glyphosate in early spring. Derr (1993) applied seven treatments in June, including glyphosate at 2.2 and 4.5 kg·ha^{-1} with or without surfactant, 2,4-D amine at 1.1 kg·ha^{-1}, dicamba at 0.6 kg·ha^{-1}, and triclopyr at 0.6 kg·ha^{-1}. Result shows that glyphosate applied at 4.5 kg·ha^{-1} provided 81% control of fresh shoot weight, but only 58% control at 2.2 kg·ha^{-1}. Shoot fresh weights were similar with glyphosate (2.2 kg·ha^{-1}), 2,4-D, dicamba and triclopyr. Glyphosate at 4.5 kg·ha^{-1} rate with surfactant also controlled the old growth (Derr, 1993).

New herbicides have been registered in the 2000s, which may control English ivy. Fluroxypyr (Vista®, 2006) has been labeled for broadleaf invasive plant management in pine plantations and non-crop sites. Aminopyralid (Milestone®, 2007) belongs to the same chemical family as triclopyr and fluroxypyr, and share the same mode of action with

2,4-D: auxin-mimic. It is a newly available land management herbicide for kudzu control. Metsulfuron (Escort®, 2001) is an effective herbicide recommended for kudzu (*Pueraria montana* var. *lobata*) control (Weaver and Lyn, 2007). Because kudzu is an invasive broadleaf vine as well, it is possible that these herbicides have potential activity on English ivy control. The objective of this study was to compare selected new herbicides with glyphosate and 2,4-D for English ivy control at varied rates.

MATERIALS AND METHODS

This study was conducted at the Paterson Greenhouses Complex, which is located at Auburn University, Auburn, Alabama. English ivy liners were potted on 21 July 2010, two plants in one container (trade gallon). The substrate used was pine bark and sand (6 : 1, v/v) which had been previously amended with 8.3 $kg \cdot m^{-3}$ of 17N-2.2P-4.2K (17-5-11) Polyon® control-release fertilizer (10 to 12 month), 3.0 $kg \cdot m^{-3}$ of ground dolomitic limestone, and 0.9 $kg \cdot m^{-3}$ of Micromax® micronutrient. Each treatment included five replications. A non-treated contol was also included. The study was treated on 31 March 2011. Applied herbicides included glyphosate at 1.08, 1.70, 2.27, 3.41, 5.45 and 8.63 $kg \cdot ha^{-1}$; 2,4-D at 0.72, 1.14, 1.52, 2.27, 3.64, and 5.68 $kg \cdot ha^{-1}$; fluroxypyr at 0.18, 0.28, 0.39, 0.57, 0.91, and 1.36 $kg \cdot ha^{-1}$; aminopyralid at 0.09, 0.12, 0.19, 0.28, 0.45, and 0.71 $kg \cdot ha^{-1}$; metsulfuron at 0.04, 0.07, 0.14, 0.21, 0.28, and 0.35 $kg \cdot ha^{-1}$. Herbicides were applied as overhead foliar spray to actively growing English ivy using an enclosed-cabinet sprayer calibrated to deliver 284 $L \cdot ha^{-1}$ with a single Teejet 800zvs vs flat fan nozzle at 193 kPa. After herbicides were applied, all pots were completely randomized, and maintained under 40% shade cover. Irrigation was cut off until 24 h after application. Overhead irrigation provided 1.3 cm daily. Control was rated at 14 (14 April), 28 (28 April), and 42 (12 May) days after treatment (DAT), based on the scale from 1 to 10, where 1 indicated no difference from non-treated control and 10 indicated a dead plant. Two authors consistently collected visual control data. After the final rating, plants were cut back to about 5.1 cm of stems, and fresh shoots were weighted. Fresh weight reduction was determined as a percentage of the non-treated control group. Reduction over 50% was defined as effective control of English ivy, and reduction over 90% as excellent control, which was considered as a desired control level. Data were subjected to ANOVA using the PROC GLM statement in SAS (SAS version 9.1). Means between and within different treatments were separated using Duncan's multiple range test at $P = 0.05$.

RESULTS

Examination of the treatments mean revealed that only glyphosate caused obvious injury at 15 DAT (Table 1). At 42 DAT, metsulfuron was the single most effective herbicide for English ivy control (Table 1). This was followed by glyphosate. Metsulfuron at the evaluated highest rate (0.35 $kg \cdot ha^{-1}$) was the most effective. Metsulfuron at rate above 0.21 $kg \cdot ha^{-1}$ provided control ratings ≥9.1 and fresh weight reduction ≥97% at 42 DAT. Metsulfuron at 0.21, 0.28, and 0.35 $kg \cdot ha^{-1}$ almost completely controlled English ivy. Metsulfuron rates below 0.21 $kg \cdot ha^{-1}$ were progressively less effective. Maximum efficacy with glyphosate was obtained with 8.63 $kg \cdot ha^{-1}$. However, treatments with glyphosate did not provide excellent control. Control rating with glyphosate at 8.63 $kg \cdot ha^{-1}$ did not exceed 5.6, and fresh weight reduction was only 69%. Rates below 8.63 $kg \cdot ha^{-1}$ were progressively less effective. However, glyphosate was previously reported to provide best control (98% at 3.0 $kg \cdot ha^{-1}$) with a March application (Neal and Skroch, 1985). Treatments with fluroxypyr, 2,4-D, and aminopyralid were ineffective, because fresh weight reduction was never over 50% compared to non-treated control.

Table 1. Efficacy of selected postemergence treatments for English ivy control.

Treatment		Control rate[1]		Fresh weight	
Herbicide	Rate ($kg \cdot ha^{-1}$)	15 DAT	42 DAT	g pot^{-1}	Reduction (%)
Glyphosate	1.08	3.7c	1.3d	62.5c	27c
	1.70	4.6b	2.1c	50.4bc	41bc
	2.27	5.1b	4.1b	22.7a	73a
	3.41	6.3a	3.6b	30.6ab	64ab
	5.45	5.4b	4.1b	28.9ab	66ab
	8.63	5.5ab	5.6a	26.0a	69a
	Mean	5.1A	3.5B	36.9B	57B
2,4-D	0.72	2.1b	1.8c	80.0a	6a
	1.14	2.3b	2.2abc	69.3a	19a
	1.52	2.2b	2.0bc	75.5a	11a
	2.27	3.0b	2.6abc	61.9a	27a
	3.64	3.2ab	2.8ab	74.6a	12a
	5.68	3.4a	3.1a	61.5a	28a
	Mean	2.7B	2.4C	70.5CD	17CD
Fluroxypyr	0.18	1.8b	1.0c	90.6a	0a
	0.28	2.3ab	1.4bc	88.7a	0a
	0.36	2.3ab	1.7b	77.5a	9a
	0.57	2.1ab	1.4bc	78.8a	7a
	0.91	2.3ab	1.9b	66.2a	22a
	1.36	3.0a	2.7a	61.0a	28a
	Mean	2.3BC	1.7C	80.5D	10D
Aminopyralid	0.09	2.0a	1.0b	68.7a	19a
	0.12	1.4a	1.5ab	67.8a	20a
	0.19	1.9a	1.7ab	65.3a	23a
	0.28	2.2a	2.0ab	64.0a	25a
	0.45	2.7a	2.6a	57.2a	33a
	0.71	2.1a	2.6a	55.3a	35a
	Mean	2.1CD	1.9C	60.6C	29C
Metsulfuron	0.04	1.7a	2.7c	31.5c	63c
	0.07	2.0a	6.5b	12.9b	85b
	0.14	1.5a	7.4b	13.3b	84b
	0.21	1.7a	9.1a	2.9ab	97ab
	0.28	2.1a	9.3a	1.6a	98a
	0.35	1.6a	9.5a	0.1a	99a
	Mean	1.8D	7.4A	10.4A	88A
Non-treated		1.0	1.0	84.9	0

[1]Treatment means within a column of an individual herbicide that are followed by the same lower case letter are statistical equivalent according to Duncan's multiple range test (p = 0.05). Herbicide means within a common column and followed by the same upper case letter are also equivalent according to the same test.

DISCUSSION

In this study, metsulfuron above 0.21 $kg \cdot ha^{-1}$ provided excellent control of English ivy (97%). Glyphosate was also effective (>50% fresh weight reduction) at rate equal or greater than 2.27 $kg \cdot ha^{-1}$, but did not provide excellent control. Metsulfuron had more

efficacy than glyphosate in the control of English ivy. Fluroxypyr, 2,4-D, and aminopyralid were not effective in controlling English ivy, and rates did not affect the control. There is no metsulfuron-containing product registered in landscape use; however, our data showed it does have potential for English ivy control. Future research will be conducted to evaluate landscape crop tolerance to directed application of metsulfuron.

Literature Cited

Beck, K.G., Zimmerman, K., Stone, J., Lukens, R.R., Reichard, S., Randall, J., Cangelosi, A.A., Cooper, D. and Thompson, J.P. 2008 Invasive species defined in a policy context: recommendations from the federal invasive species advisory committee. Invasive Plant Sci. and Manag. 1:414-421.

Biggerstaff, M.S. and Christopher, W.B. 2007. Effect of method of English ivy removal and seed addition on regeneration of vegetation in Southeastern Piedmont Forest. Amer. Midland Natl. 158(1):206-220.

Chaker, A.M. 2010. It's a scary time to be a weed. The Wall Street J. Sep. 29:D1-D2.

Derr, J.F. 1993 English ivy (*Hedera helix*) response to postemergence herbicides. J. Environ. Hort. 11(2):45-48.

Gilman, E.F. 1999 *Hedera helix*-English ivy. University of Florida fact sheet. http://hort.ifas.ufl.edu database documents pdf shrub_fact_sheets hedhela.pdf.

Miller, J.H. 2007 Nonnative invasive plants of southern forestry. p.36-37, 80.

Neal, J.C. 1998. Postemergence, non-selective herbicides for landscape and nurseries. NC State University. Horticulture information leaflets. http://www.ces.ncsu.edu/depts/hort/hil/hil-648.html.

Neal, J.C. and Skroch, W.A. 1985. Effects of timing and rate of glyphosate application on toxicity to selected woody ornamentals. J. Amer. Soc. Hort. Sci. 110:860-864.

Randell, J.M. 1996. Weed Control for the preservation of biological diversity. Weed Technol. 10:370-383.

Reichard, S. and P. White. 2001. Horticulture as a pathway of invasive plant introductions in the United States. BioScience 51:103-113.

Soll, J. 2005. Controlling English ivy (*Hedera helix*) in the Pacific Northwest. http://tncweeds.ucdavis.edu moredocs hedhe102.pdf. Accessed: 23 October 2007.

USDA, NRCS. 2002. The PLANTS database. Version 3.5 http://plants.usda.gov National plant data center, Baton Rouge, Louisiana 70874-4490 USA. 1 Nov. 2002.

Weaver, M.A. and M.E. Lyn. 2007. Compatibility of biological control agent with herbicides for control of invasive plant species. Natural Areas J. 27(3):264-268.

Wyman, D. 1994. Shrub and Vines for American Gardeners. The Macmillan Co., London.