Combined Proceedings IPPS 68:308-313. 2018.

Safety and Efficacy of Postemergence Herbicides for Container-Grown Landscape Groundcovers

Crystal J. Conner, Chris Marble, and Annette Chandler
Mid-Florida Research and Education Center, University of Florida, 2725 S. Binion Road, Apopka, Florida 32703, USA

c.conner@ufl.edu

Keywords: Landscape nursery, weed management, Asiatic jasmine, *Trachelospermum asiaticum* 'Minima', perennial peanut, *Arachis glabrata* 'Ecoturf'.

Abstract

Research was conducted on crop tolerance of Asiatic jasmine (*Trachelospermum asiaticum* 'Minima') and perennial peanut (*Arachis glabrata* 'Ecoturf') to postemergence herbicides including bentazon, sulfentrazone, iron HEDTA, indaziflam (a preemergence herbicide), sulfosulfuron, and clopyralid. Efficacy of these herbicides was evaluated on flowering eclipta (*Eclipta prostrata*) and hairy beggarticks (*Bidens pilosa*). All herbicides with the exception of bentazon caused no significant damage to Asiatic jasmine; injury resulting from bentazon was minimal. In perennial peanut, the highest injury was noted in plants treated with indaziflam, sulfosulfuron, or clopyralid, but injury was less than 30% and considered acceptable. All herbicides evaluated provided poor control of either weed species with the exception of clopyralid, which provided over 90% control of hairy beggarticks. Results indicate that several postemergence herbicides labeled for use in either nurseries or landscapes could be used to manage weeds in Asiatic jasmine or perennial peanut groundcovers, but further testing is needed.

INTRODUCTION

Turfgrass is the most widely planted irrigated crop in the United States and occupies the vast majority of most residential and commercial landscapes in Florida (NTRI, 2003). However, the common mantra of landscape design is "right plant right place".

In many neighborhoods, parks, and other areas containing significant tree canopy,

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turfgrass is not suitable due to limited sunlight. Additionally, many homeowners may opt for more low maintenance groundcovers if they do not want to install irrigation, mow, or make regular fertilizer applications. Topography, drainage, soil health, and other factors may also make it difficult for some to have healthy and sustainable lawns in all or part of their landscape.

In cases where turf is not suitable or desirable, many different groundcovers are available as turf alternatives. In Florida, the most common turf alternatives are perennial peanut (*Arachis glabrata*) and asiatic jasmine (*Trachelospermum asiaticum*). These groundcovers offer several advantages in that they are both very drought tolerant once established, require little to no fertilization, and in the case of Asiatic jasmine, can be planted in heavy shade or full sun conditions. Both groundcovers also offer significant advantages in terms of resistance to arthropods or fungal pathogens that infect almost all of the warm season turfgrass species planted in Florida. While these groundcovers offer many advantages over turfgrass in certain scenarios, the biggest disadvantage is that there are few postemergence options for weed control in non-turf groundcovers - while either in production or after landscape establishment.

Several herbicides can be used in perennial peanut (Sellers and Ferrell, 2018), but most are not labeled for use in nurseries or landscapes with the exception of certain graminicides, such as clethodim. In both production and landscapes, glyphosate is often applied for weed control in asiatic jasmine which may be safe in some instances but can cause significant injury after two applications or when applications are made at certain times of the year (Van Hoogmoed, 2012). The objective of this research was to identify potential postemergence herbicides that could be applied over-the-top of these groundcover species while in production (container-grown) and determine efficacy of these herbicides on common broadleaf weed species.

MATERIALS AND METHODS

These trials were conducted at the Mid-Florida Research and Education Center in Apopka, FL in 2018. Nursery containers (946 ml) were filled with a 70:30 pine-bark:peat substrate and topdressed with Osmocote® (ICL Specialty Fertilizers) 17-5-11 fertilizer (8-9 mo.) at a rate of 4 grams per pot. After filling, approximately 30 seeds of hairy beggarticks (*Bidens pilosa*) or eclipta (*Eclipta prostrata*) were surface sown by hand. Pots were placed on a full sun nursery pad and received 1.3 cm of overhead irrigation per day. These two weed species were allowed to grow for approximately 5 weeks until flower development. When the two weed species began to reach the reproductive growth stage, trade gallon (3.0L) containers of asiatic jasmine (*Trachelospermum asiaticum* 'Minima') and perennial peanut (*Arachis glabrata* 'Ecoturf') were purchased from a local nursery and placed on the nursery pad described previously.

On 30 July [29°C (85°F), 72% relative humidity, winds calm, partly cloudy] herbicides were applied over-the-top of both weed and groundcover species using a CO_2 backpack sprayer calibrated to deliver 468 L ha^{-1} (50 gal $acre^{-1}$) (Table 1). Following treatment, plants were grouped by species in a completely randomized design with 10 replications per herbicide treatment for each weed species and 6 replications per herbicide treatment for each groundcover species. Data collected included visual injury ratings at 7, 14, and 28 days after treatment (DAT) for the groundcover species. For weed species, visual ratings (control ratings for weeds, injury ratings for groundcovers) were recorded at 7, 14, and 21 DAT. In both cases, ratings were based on a 0 to 100 scale, 0 = no injury (or control) and 100 = complete plant death. At

21 DAT, shoot weights were collected for both weed species by cutting plants at the soil line. Fresh weights were converted to percent control using the formula:
[(fresh weight non-treated – fresh weight treated)/fresh weight non-treated) x 100].

Data were analyzed using a mixed model analysis in JMP with herbicide treatment as a fixed effect and replication as a random effect. Means were separated using Fisher's LSD at a 0.05 significance level.

RESULTS

At 7 DAT, only very minor injury was noted in asiatic jasmine treated with bentazon at either rate (Table 1). However, injury ratings were $\leq$5% and considered commercially acceptable. All other treatments resulted in injury ratings similar to the nontreated plants. Similar trends were noted at both 14 and 28DAT with minor injury observed in jasmine treated with bentazon and no injury following treatment with any other herbicide. Injury observed included chlorosis and some minor burning on new growth.

In perennial peanut, at least some injury was noted in all herbicide treatments at 7DAT but applications of sulfentrazone, iron HEDTA (50 fl. oz.), indaziflam, and sulfosulfuron resulted in injury ratings similar to the nontreated control. Injury ratings increased in most treatments at 14DAT. At this time, the highest injury was noted in plants treated with indaziflam, although peanut treated with bentazon (either rate), sulfosulfuron, and clopyralid displayed similar injury. At 28DAT, recovery was noted in most treatments with the exception of peanut treated with indaziflam, sulfosulfuron, and clopyralid, which had injury ratings of 23 to 27%. All other treatments had injury ratings of <8% and were similar to nontreated plants.

Herbicides evaluated in these studies generally provided poor control of eclipta. Clopyralid (47%) provided the greatest reduction in shoot fresh weights along with sulfentrazone (12 fl. oz.) (35%) and indaziflam (37%) which provided similar control (Table 2). All other treatments provided approximately 30% reduction in shoot fresh weights or less. While clopyralid provided approximately 50% reduction in shoot fresh weights, this level of control was considered unacceptable. Clopyralid provided a high level of hairy beggarticks control (91%) and outperformed all other herbicide treatments. The next most efficacious treatment was indaziflam providing 56% control. All other herbicides provided 15% control or less and were similar. In a nursery or landscape setting, the only treatment that would have been considered acceptable was clopyralid.

DISCUSSION

Results from this research indicate that several postemergence herbicides could be applied over the top of asiatic jasmine or perennial peanut with minimal to no crop damage. Currently the only herbicide labeled for use in either of these groundcovers is sulfosulfuron, which is labeled for use in asiatic jasmine growing in landscapes (Anonymous, 2016). Bentazon is labeled for use in peanuts (as Basagran®) in cropping systems, but currently Basagran® T/O is not labeled for use in perennial peanut in landscape or nursery situations. Of the herbicides tested, all are currently labeled for use in landscapes. Bentazon, sulfentrazone, iron HEDTA, and indaziflam are also labeled for use in nurseries, but not as over-the-top applications in container-grown ornamentals. It should be noted that while indaziflam was evaluated in this study as a postemergence herbicide, it is a preemergence herbicide but has shown some postemergence activity (Anonymous, 2013; Brosnan et al., 2012).

Table 1. Tolerance of minima jasmine (*Trachelospermum asiaticum* 'Minima') and perennial peanut (*Arachis glabrata* 'Ecoturf') to selected postemergence herbicides.

			Injury ratings (0 to 100%)[z]					
			Asiatic jasmine			Perennial peanut		
Trade name	Herbicide	Rate[y]	7DAT[x]	14DAT	28DAT	7DAT	14DAT	28 DAT
Basagran T/O	bentazon	24 fl. oz.	5 a	7 b	5 b	10 ab	12 a-e	8 b
Basagran T/O	bentazon	32 fl. oz.	3 ab	16 a	18 a	17 a	17 abcd	7 b
Dismiss	sulfentrazone	8 fl. oz.	0 c	0 c	0 c	7 bc	10 bcde	8 b
Dismiss	sulfentrazone	12 fl. oz.	0 c	0 c	0 c	3 bc	7 cde	7 b
Fiesta	iron HEDTA	25 fl. oz.	2 bc	0 c	0 c	12 ab	7 cde	3 b
Fiesta	iron HEDTA	50 fl. oz.	0 c	0 c	0 c	7 bc	5 de	7 b
Marengo SC	indaziflam	9 fl. oz.	0 c	0 c	0 c	3 bc	23 a	25 a
Certainty	sulfosulfuron	1.25 oz.	0 c	0 c	0 c	7 bc	22 ab	23 a
Lontrel	clopyralid	1 pint	0 c	0 c	0 c	12 ab	18 abc	27 a
Control	NA	---	0 c	0 c	0 c	0 c	0 e	0 b

[z]Injury ratings were recorded on a scale of 0 to 100, 0 = no injury, 100 = dead plant.

[y]Rate shows amount of formulated product applied on a per acre basis. Rates were generally low and high recommended labeled rates.
[x]DAT = days after treatment.

[w]Means within a column followed by the same letter are not significantly different according to Fisher's Least Significant Differences test ($p = 0.05$).

Table 2. Efficacy of selected postemergence herbicides for control of hairy beggarticks (*Bidens pilosa*) and eclipta (*Eclipta prostrata*).

			Eclipta	Hairy beggarticks
Trade name	Herbicide	Rate[z]	Percent control (0 to 100%)[y]	
Basagran T/O	bentazon	24 fl. oz.	17 cd	12 c
Basagran T/O	bentazon	32 fl. oz.	17 cd	12 c
Dismiss	sulfentrazone	8 fl. oz.	31 bc	6 c
Dismiss	sulfentrazone	12 fl. oz.	35 ab	12 c
Fiesta	iron HEDTA	25 fl. oz.	6 d	8 c
Fiesta	iron HEDTA	50 fl. oz.	6 d	4 c
Marengo SC	indaziflam	9 fl. oz.	37 ab	56 b
Certainty	sulfosulfuron	1.25 oz.	6 d	15 c
Lontrel	clopyralid	1 pint	47 a	91 a

[z]Rate shows amount of formulated product applied on a per acre basis. Rates were generally low and high recommended labeled rates.

[y]Percent control was calculated based on percent reduction in shoot fresh weights in relation to the non-treated control group.

[x]Means within a column followed by the same letter are not significantly different according to Fisher's Least Significant Differences test ($p = 0.05$).

The only herbicide that showed a high level of control of either weed species tested was clopyralid, which provided over 90% control of hairy beggarticks. Weeds tested in this trial were mature and had reached the flowering stage. Treating weeds at this mature stage of growth most often results in reduced efficacy, especially for contact action herbicides (Senseman, 2007). While the herbicides evaluated in this trial generally provided less than ideal control, all have shown a high degree of efficacy on numerous broadleaf and sedge weeds (Neal et al., 2017).

Some injury was noted in these trials but at all evaluations, injury was within acceptable levels (<30%). In some landscape (or production) scenarios, even minor injury may not be acceptable and as these herbicides are not labeled for over-the-top application to the groundcovers evaluated (with the exception of sulfosulfuron), the applicator would assume liability. Additionally, greater or less injury could potentially be observed under different environmental conditions. A major deterrent in the use of these groundcovers is the lack of postemergence herbicides that can be used, and the fact that weeds often become highly problematic once these species are transplanted, especially during the establishment phase.

Further testing is needed to determine safety of these productions under different scenarios and to determine if these products could be candidates for label expansion in the future.

However, this preliminary work indicates that several currently available herbicides can be used in these species for postemergence weed control both while in production and following landscape transplanting.

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