

Influence of Herbicide Application Volume on Weed Control in Non-Irrigated Nursery Production Areas[©]

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ABSTRACT

Preemergence (PRE) herbicides require activation with rainfall or irrigation within 1 – 3 weeks after application in order to perform effectively. During dry weather periods, erratic weed control may result if herbicides are not properly activated. In this study flumioxazin (SureGuard® SC) and indaziflam (Marengo®), two PRE herbicides utilized in bareground areas of nurseries and as directed applications in larger containers (often not irrigated with overhead sprinklers), were examined at different application volumes to determine if increasing herbicide application volume could increase weed control in the absence of activation irrigation. Flumioxazin was applied at 8 and 12 fl. oz. per acre while Marengo was applied at 7.5 and 15 fl. oz. per acre to 1.3 L containers filled with a pinebark:peat substrate using application volumes of 5, 10, 20, 40, 60, 80, or 100 gallons per acre (gpa) for control of common nursery weed species. The most consistent control was achieved with the high rate of Marengo across all application volumes (91 to 100% control) while SureGuard provided the most consistent results across all application volumes at both rates, with percent control ranging from 61 to 84% control. It is recommended that growers use application volumes at least as high as or higher than suggested on herbicide product labels and still attempt to time applications when some rainfall is expected in the coming days if possible.

INTRODUCTION

Florida and many other areas experience unusual weather patterns and may experience prolonged periods of dry weather. When applying a PRE herbicide, sufficient irrigation (typically 0.25 to 0.5 in.) is necessary in order to activate the herbicide within the soil. Otherwise, sporadic weed control may develop, as herbicide can be lost via volatility or other means. The length of time in which a herbicide must be activated varies with different herbicides, but is typically anywhere between a few days up to several weeks. Weed control in and around non-crop production areas (soil storage, roadways, aisles, etc.) is important to prevent weeds from encroaching into production areas. However, if no rainfall occurs and the area is not irrigated - growers have no way to properly activate the herbicide. Lack of rainfall is also important in large containers that are irrigated via spray-stakes or drip irrigation which may not sufficiently activate a herbicide.

When applying herbicides to non-crop areas, growers will typically apply these products using low application volumes 15 to 30 gallons per acre because it is more efficient. There is no data available on the influence of application volume on efficacy of preemergence herbicides used in nursery production. The objective of this research project was to determine if PRE herbicide efficacy could be increased by increasing the herbicide application volume in times where rainfall was not expected and overhead irrigation was not available.

METHODS AND MATERIALS

Nursery pots (1.3 L) were filled with a standard pinebark:peat growing media (Fafard 52, SunGro Horticulture) and amended with Osmocote Plus 17-5-11 at a rate of 12 lbs. per cubic yard. After pots were filled, flumioxazin (SureGuard® SC) was applied at 8 or 12 oz. per acre and indaziflam (Marengo®) was applied at 7.5 or 15 fl. oz. per acre using a CO₂ backpack sprayer. Each herbicide and each rate was applied using an application volume of 5, 10, 20, 40,

60, 80, or 100 gpa. Once the appropriate PRE herbicide was applied, the pots were moved to a rainout shelter and received no rainfall or irrigation for a 28 day period. After 28 days, pots were moved to a quonset greenhouse and overseeded with equal amounts of eclipta (*Eclipta prostrata*) seeds and spotted spurge (*Chamaesyce maculata*) seeds. After pots were overseeded, they received 0.35 in. of overhead per day for a duration of eight weeks. Data collected included visual percent control ratings in comparison with nontreated pots (0 to 100, 0 = 0% control; 100 = 100% control) at 2, 4, 6, and 8 weeks after seeding (WAS) and shoot dry weight data was collected at 8 WAS. Shoot fresh weight data was converted to percent control ratings using the formula [(fresh weight of nontreated – fresh weight of treated)/fresh weight non-treated] *100. Data was analyzed using the Proc GLM procedure in SAS and treatment means separated using Fisher's LSD test ($p=0.05$). For the sake of brevity, only fresh weight data will be discussed.

RESULTS

When examining data across both rates and across all application volumes, herbicide was not significant with indaziflam and flumioxazin providing 81 and 80% control, respectively (**Table 1**). Herbicide rate was significant with the rate of both products providing 89% control and the low rate providing 72% across all application volumes and both herbicides. Few differences were seen when herbicides were applied at an application volume of at least 10 gpa.

When examining individual herbicides applied at the two different rates, results varied at different application volumes and there was no clear trend in terms of higher application volume increasing control (**Fig. 1**). Application volumes of 10 to 100 gpa provided approximately 80 to 90% weed control while only 64% control was seen when an application volume of 5 gpa was used (**Table 2**). The high rate of Marengo provided better control than any other treatment at

application volumes of 5, 20, 40, and 80 gpa (**Table 3**). The low rate of Marengo was similar to both rates of SureGuard at most application volumes.

CONCLUSION

The high rate of Marengo generally provided the best control of eclipta and spurge across all application volumes, resulting in 91 to 100% control. However, the low rate provided variable control ranging from 20 to 87% control. SureGuard was generally consistent across both rates and across all application volumes with control ranging from 61 to 87% control. Based on results of this trial, using application volumes higher than recommended (10 and 5 gpa for Marengo and SureGuard, respectively) did not significantly improve weed control when the herbicide was not activated. Growers should continue to apply preemergence herbicides according to label instructions and use application volumes at least as high as recommended on product labels. It should be noted that this trial was conducted using a soilless substrate, and results could vary in field soils. This trial was also not conducted using an activated control, a treatment in which irrigation was applied within the time period specified on product labels. Future work will evaluate use of multiple application volumes in a variety of field soils and also utilize irrigated controls to further determine the impact of different application volumes on weed control.

Table 1. Main effect of herbicide, rate, and application volume on percent control^z (biomass reduction) of spotted spurge and eclipta in absence of activation moisture.

Herbicide^y	Marengo®	81 a ^v	Application^x	5	64 b
	SureGuard®	80 a		Volume	10
Rate^w	Low	72 b		20	79 a
				40	84 a
	High	89 a		60	82 a
				80	85 a
				100	84 a

^zPercent control was calculated by using the formula ((dry wt. of nontreated - dry weight of treated)/dry weight of nontreated)*100.

^yMarengo® SC (indaziflam, BayerCrop Science, Research Triangle Park, NC); SureGuard® SC (flumioxazin, Nufarm Inc., Alsip, IL).

^xApplication volume is shown in gallons per acre.

^wRates applied included 7.5 and 15 fl. oz. formulated product per acre for Marengo and 8 and 12 fl. oz. formulated product per acre for SureGuard for the low and high rates, respectively.

^vMeans followed by the same letter in each category are not significantly different according to Fisher's LSD ($p=0.05$)

Table 2. Impact of application volume on efficacy of two herbicides^z applied at labeled rates without application activation moisture for control of spotted spurge and eclipta.					
Application Volume^w	Ratings^y				Shoot F.W.^x
	2 WAS^v	4 WAS	6 WAS	8 WAS	Percent Control
5	95 c ^u	77 c	64 b	60 b	64 b
10	100 a	92 a	83 a	77 a	87 a
20	97 bc	83 bc	73 ab	66 ab	79 a
40	99 ab	90 ab	79 a	71 ab	84 a
60	99 ab	89 ab	75 ab	68 ab	82 a
80	99 ab	89 ab	78 a	74 a	85 a
100	99 ab	90 ab	80 a	72 ab	84 a

^zData shows means of SureGuard® (flumioxazin) and Marengo® (indaziflam) herbicide applied at rates of 8 and 12 fl. oz. per acre for SureGuard® and 7.5 and 15 fl. oz. for Marengo®.

^yRatings were taken on a scale of 0 to 100 (0 = 0% control, 100 = 100% control) based upon percent coverage of non-treated pots.

^xShoot F.W. = shoot fresh weights collected at 8 weeks after seeding. Shoot dry weight data were converted to percent control ratings using the formula ((weight nontreated - weight of treated)/weight of nontreated)*100.

^vWAS = weeks after seeding. Pots were treated and were not seeded or irrigated for 28 days after herbicides were applied.

Table 3. Effect of herbicide and rate on efficacy of indaziflam (Marengo®) and flumioxazin (SureGuard®) when applied at 7 different application volumes in the absence of activation moisture for control of spotted spurge and eclipta.

Herbicide	Rate	Application Volume (GPA)						
		5	10	20	40	60	80	100
		Percent Control ^z						
Marengo	7.5 fl.oz.	20 d ^y	85 ab	55 b	80 b	68 b	79 b	87 ab
	15 fl.oz.	96 a	96 a	99 a	99 a	91 a	100 a	97 a
SureGuard	8 fl.oz.	61 c	76 b	55 b	72 b	84 a	77 b	79 b
	12 fl.oz.	79 b	93 a	68 b	80 b	91 a	84 b	75 b

^zPercent control calculated using the formula ((shoot dry weight nontreated - dry weight treated)/dry weight of nontreated)*100.

^yMeans within a column followed by the same letter are not significantly different according to Fisher's LSD ($p=0.05$).

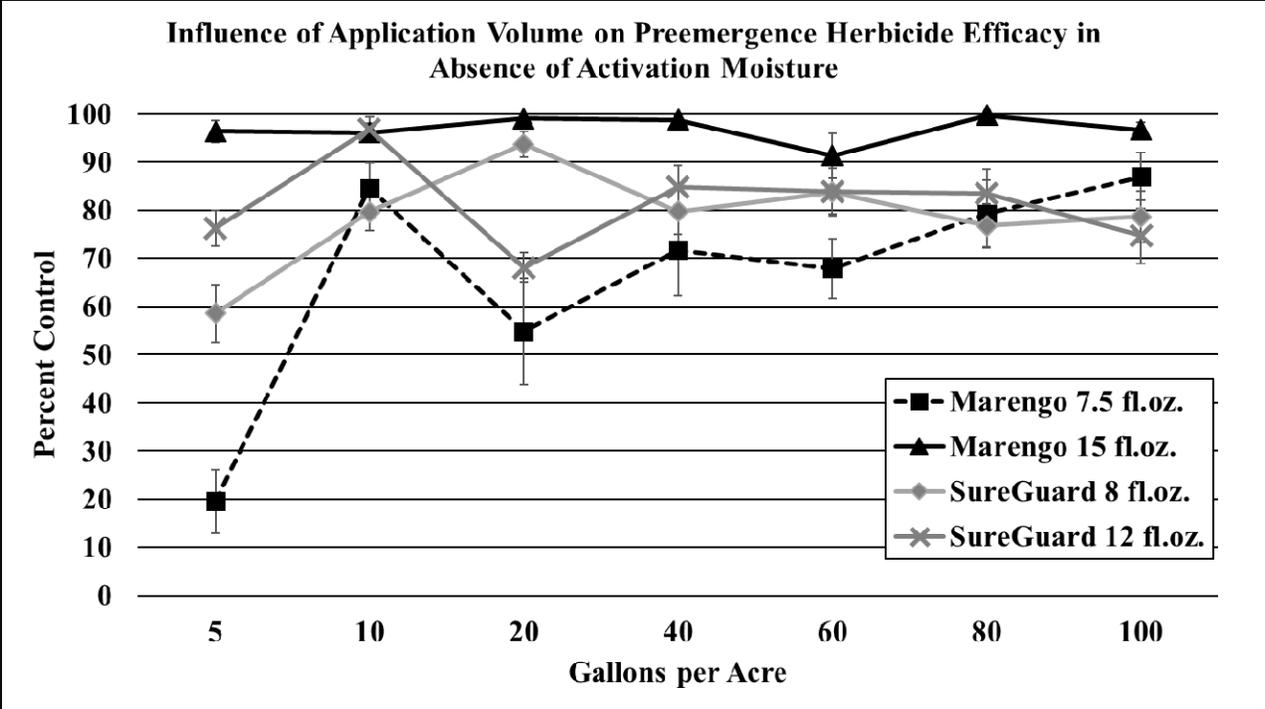


Figure 1. Influence of application volume on preemergence herbicide efficacy in absence of activation moisture.