

Evaluation of Glyphosate as a Pre-cultivation, Preplant Herbicide for Woody Ornamentals¹

by David L. Hensley and Philip L. Carpenter

Abstract. Glyphosate (2.24 kg/ha) and paraquat (4.48 kg/ha) applied eight days prior to planting killed existing weeds but had no effect on subsequent weed populations and caused no injury to *Cornus sericea*, *Juniperus horizontalis*, 'Bar Harbor,' *Juniperus chinensis* 'Hetzi' and *Taxus cuspidata* 'Nana.'

Establishment of nursery crops on new fields or previously cropped land and in many landscape situations is complicated by existing populations of perennial weed species. Postemergent herbicides have been used to control selected perennial weeds. Foliar applied glyphosate (N-phosphonomethyl-glycine) provides good control for johnsongrass (*Sorghum halepense*), purple nutsedge (*Cyperus rotundus*), field bindweed (*Convolvulus arvensis*) and a number of other perennial species but has little or no preemergence activity when applied to soil at normal use rates (1). This study was conducted to determine if glyphosate could be used as a preplant treatment to control perennial weeds.

The study was conducted on a fallow field of loamy fine sand with a pH of 6.7 and organic matter content of 1.5%. Weed population consisted of numerous perennial and annuals with curly dock (*Rumex crispus*) and bluegrass (*Poa* sp.) the most abundant perennial species and smartweed (*Polygonum* sp.) the most predominant annual species.

Preplant applications of glyphosate (2.24 kg/ha) and paraquat (1,1'-dimethyl-4,4'-bipyridinium ion)(4.48 kg/ha) were made with 234 liters water/ha. Eight days after application the area was fertilized with 110 kg 12-5.2-10 (N-P-K)/ha and tilled to a 15 cm depth.

Bailey redstem dogwood (*Cornus sericea*), 'Bar Harbor' juniper (*Juniperus horizontalis* 'Bar Harbor'), 'Hetzi' juniper (*Juniperus chinensis* 'Hetzi') and Japanese spreading yew (*Taxus cuspidata* 'Nana') were planted in each plot within 2 days

after cultivation. Each treatment contained three plants of each species with five replications.

Immediately after planting, simazine (2-chloro-4,6 bis (ethylamino)-s-triazine)(1.12 kg/ha) and diphenamid (N, N-dimethyl-2, 2-diphenylacetamide)(4.48 kg/ha) were applied to appropriate plots (Table 1).

The number and species of weeds in 3 separate 0.1 m² areas were determined 23 and 63 days after application of preemergent herbicides. Plots were hand weeded after each count. Fresh weights of tops of the woody ornamentals were determined 113 days after planting.

Large crabgrass (*Digitaria sanguinalis*) was the major weed species during the first evaluation. Simazine and diphenamid provided better weed control than the control or preplant treatments alone (Table 2). Serial applications of glyphosate and preemergent herbicides did not provide better total control of weeds than application of preemergents alone. Fewer perennial weed species, however, were found in the plots receiving preplant applications of glyphosate (Table 2.)

The second evaluation indicated the same pattern (Table 2), but the total weed population was reduced. Total control was significantly greater in those treatments which included preemergence herbicides. Control of perennial species, although

Table 1. Pre- and post-planting herbicide treatments

Herbicides	
Pre-plant	Post-plant
None	None
Glyphosate	None
Paraquat	None
None	Simazine + Diphenamid
Glyphosate	Simazine + Diphenamid
Paraquat	Simazine + Diphenamid

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Table 2. Weed control utilizing various combinations of postemergent and preemergent herbicides.

Treatment	Weed control ^z (% of control)					
	Crabgrass ^y		Broadleaf perennials ^x		Total weeds ^w	
	Count 1	Count 2	Count 1	Count 2	Count 1	Count 2
Check	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Glyphosate	0.0 a	31.5 a	74.2 c	50.0 a	4.9 a	23.2 a
Paraquat	0.0 a	23.7 b	57.0 b	0.0 a	17.8 a	12.6 a
Simazine + Diphenamid	97.0 b	80.4 c	78.9 c	0.0 a	92.3 b	60.1 b
Glyphosate + Simazine + Glyphosate	98.4 b	80.4 c	99.2 c	100.0 a	98.2 b	78.5 b
Paraquat + Simazine + Diphenamid	99.9 b	83.1 c	94.5 c	50.0 a	98.0 b	75.3 b

^z Mean separation in columns by Duncan's multiple range test, 5% level.

^y Percent control based on 2249.7 individual crabgrass plants in count 1 and 265.7 individual plants in count 2 per square m.

^x Percent control based on 91.4 individual broadleaf perennials in count 1 and 1.4 individual plants count 2 per square m. Curly dock (*Rumex crispus* L.) and clover (*Trifolium repens* L.) were the primary broadleaf perennial weed species.

^w Percent control based on 2382.1 total weeds in count 1 and 295.7 total weeds in count 2 per square m.

not statistically significant, appeared better in plots receiving preplant applications of glyphosate.

No herbicide injury to any crop plants was observed. There was no reduction in fresh weights of *J. horizontalis* 'Bar Harbor' or *C. sericea* among the treatments (Table 3).

Fresh weights of *Taxus* were significantly greater in the paraquat + preemergence herbicides treatment than in the paraquat alone and glyphosate + preemergence herbicides plots, but these treatments were not significantly different from the control or other herbicide applications.

Fresh weights of *J. chinensis* 'Hetzi' were significantly greater in the glyphosate +

preemergence herbicides and the simazine + diphenamid than in the paraquat preplant treatment. These treatments were not, however, significantly different than the other applications or control.

Postemergence herbicide applications prior to cultivation and planting, followed by postplant, preemergence treatments caused no significant reduction of the total weed population over the preemergent herbicide treatments alone. The perennial weed population did not include bindweed or many other persistent perennial weed pests found in many nursery and landscape sites.

A possible benefit derived from preplant, pre-cultivation, postemergence application would be

Table 3. Plant growth (fresh weight) when treated with various combinations of postemergent and preemergent herbicides.

<i>Treatment</i>	<i>Fresh Weights/g^z</i>			
	<i>Taxus</i>	<i>J. chinensis</i> <i>Hetzi</i>	<i>J. horizontalis</i> <i>Bar Harbor</i>	<i>Cornus sericea</i>
Check	13.5 ab	18.0 ab	17.0 a	95.3 a
Glyphosate	12.7 ab	15.1 ab	13.8 a	108.8 a
Paraquat	12.1 b	12.8 b	14.8 a	102.0 a
Simazine + Diphenamid	15.3 ab	22.4 a	19.8 a	130.4 a
Glyphosate + Simazine + Diphenamid	11.9 b	23.4 a	18.0 a	119.6 a
Paraquat + Simazine + Diphenamid	16.6 a	19.9 ab	17.3 a	131.1 a

^z Mean separation in columns by Duncan's multiple range test, 5% level.

reduction of persistent perennial weeds. Preplant application of glyphosate would eliminate the existing weed population including most perennial species. Because of the additional expenditure for these materials, such treatments may not be justified if the prospective site is devoid of noxious perennial species.

Literature Cited

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*Department of Horticulture
Kansas State University
Manhattan, Kansas 66506
and
Department of Horticulture
Purdue University
W. Lafayette, Indiana 47907*