Effects of Herbicide Application Timing on Field Grown Tulip, Narcissus, and Bulbous Iris

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Weed control studies were conducted on 'Merry Widow' tulip, 'Dutch Master' daffodil, and 'Blue Diamond' iris at Washington State Univeristy Mount Vernon beginning in the fall of 2000. Thiazopyr, pendimethalin, diuron, isoxaben, and oryzalin were applied in combination with glyphosate or glufosinate. Application timings were (1) all in the fall, (2) all in the spring (preemergence), (3) all in the spring (early postemergence), (4) half in the fall/half in the spring (preemergence), or (5) half in the fall/half in the spring (early postemergence). The spectrum and efficacy of weed control and crop safety were evaluated.

Initial "fall" treatments were made on December 5, preemergence (PRE) to all bulbs. The "spring" PRE treatments were made January 23, when iris averaged 3 inches tall and tulip and daffodil were just starting to emerge from soil (leaf tips barely visible). Glyphosate was applied with the residual herbicide in these treatments. The "spring" postemergence (POST) treatments with glyphosate were made February 22 and with glufosinate February 27. Average iris height at this timing was 5 inches, while daffodils were 3 inches, and tulip were 2 inches.

Weed control was estimated February 20 (PRE only), March 7, April 17, and June 15. Injury to bulb foliage was estimated March 7 and April 17. Flowers were counted in each plot and height of five typical flowers was measured April 2 (daffodil), April 17 (tulip), and May 22 (iris). Bulbs were dug at maturity, then cleaned, sorted, counted, and weighed. Tulip was more sensitive to herbicide treatments than either daffodil or iris, so only tulip data are presented here.

Table 1. Weed control in ornamental bulbs treated with various herbicide combinations and timings.

Residual herbicide	Nonselective herbicide[a]	Timing[b]	Weed control 2/20/01	3/7/01	4/17/01	6/15/01
			---------- % ----------			
Thiazopyr (0.75 lb/a)	Glyphosate	Fall	100	100	100	99
	Glyphosate	Spring, PRE	93	100	100	98
	Glyphosate	Spring, POST	—	86	100	97
	Glufosinate	Spring, POST	—	84	100	97
	Glyphosate	Fall + Spring, PRE	100	100	100	100
	Glyphosate	Fall + Spring, POST	98	100	100	98
	Glufosinate	Fall + Spring, POST	97	100	100	100
Diuron (3.2 lbs/a)	Glyphosate	Fall	100	100	100	99
	Glyphosate	Spring, PRE	94	99	100	99
	Glyphosate	Spring, POST	—	60	100	98
	Glufosinate	Spring, POST	—	56	100	100
	Glyphosate	Fall + Spring, PRE	100	100	100	100
	Glyphosate	Fall + Spring, POST	100	100	100	100
	Glufosinate	Fall + Spring, POST	100	100	100	100
Isoxaben (0.5 lb/a)	Glyphosate	Fall	75	88	75	59
	Glyphosate	Spring, PRE	94	99	100	78
	Glyphosate	Spring, POST	—	80	100	92
	Glufosinate	Spring, POST	—	74	95	78
	Glyphosate	Fall + Spring, PRE	99	100	100	81
	Glyphosate	Fall + Spring, POST	98	100	100	76
	Glufosinate	Fall + Spring, POST	99	100	100	84
Pendimethalin (3.0 lbs/a)	Glyphosate	Fall	97	99	100	94
	Glyphosate	Spring, PRE	91	99	100	96
	Glyphosate	Spring, POST	—	75	100	96
	Glufosinate	Spring, POST	—	88	98	94
	Glyphosate	Fall + Spring, PRE	98	100	100	97
	Glyphosate	Fall + Spring, POST	97	100	100	97
	Glufosinate	Fall + Spring, POST	99	100	100	98
Oryzalin (0.75 lb/a)	Glyphosate	Fall	99	100	100	96
	Glyphosate	Spring, PRE	91	93	96	89
	Glyphosate	Spring, POST	—	83	100	97
	Glufosinate	Spring, POST	—	89	95	92
	Glyphosate	Fall + Spring, PRE	98	100	100	96
	Glyphosate	Fall + Spring, POST	98	100	100	96
	Glufosinate	Fall + Spring, POST	100	100	100	98
$LSD_{0.05}$			17	12	ns	7

[a] Glyphosate and glufosinate applied at 0.75 lb/a.
[b] Fall = all residual applied in fall; Spring = all residual applied in spring; Fall + Spring = half residual applied in fall, half applied in spring; PRE = preemergence; POST = postemergence.

Table 2. 'Merry Widow' tulip injury after treatment with various herbicide combinations and timings.

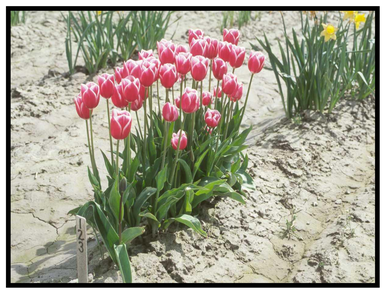
Residual herbicide	Nonselective herbicide[a]	Timing[b]	Foliar injury 3/7/01	Foliar injury 4/17/01	Flower number 4/17/01	Flower height 4/17/01
			%	%	per plot	inches
Thiazopyr (0.75 lb/a)	Glyphosate	Fall	0	5	33	11
	Glyphosate	Spring, PRE	5	3	36	12
	Glyphosate	Spring, POST	41	53	21	8
	Glufosinate	Spring, POST	3	43	32	9
	Glyphosate	Fall + Spring, PRE	1	0	32	13
	Glyphosate	Fall + Spring, POST	15	43	26	9
	Glufosinate	Fall + Spring, POST	0	28	34	11
Diuron (3.2 lbs/a)	Glyphosate	Fall	0	0	35	13
	Glyphosate	Spring, PRE	1	5	32	11
	Glyphosate	Spring, POST	1	20	34	10
	Glufosinate	Spring, POST	3	40	29	9
	Glyphosate	Fall + Spring, PRE	0	9	31	12
	Glyphosate	Fall + Spring, POST	4	28	32	10
	Glufosinate	Fall + Spring, POST	0	16	35	11
Isoxaben (0.5 lb/a)	Glyphosate	Fall	10	3	31	12
	Glyphosate	Spring, PRE	13	10	29	11
	Glyphosate	Spring, POST	4	55	17	7
	Glufosinate	Spring, POST	3	43	28	9
	Glyphosate	Fall + Spring, PRE	11	8	34	11
	Glyphosate	Fall + Spring, POST	19	40	24	8
	Glufosinate	Fall + Spring, POST	4	30	32	9
Pendimethalin (3.0 lbs/a)	Glyphosate	Fall	3	4	33	12
	Glyphosate	Spring, PRE	1	8	38	12
	Glyphosate	Spring, POST	4	60	17	8
	Glufosinate	Spring, POST	4	38	33	9
	Glyphosate	Fall + Spring, PRE	0	8	31	11
	Glyphosate	Fall + Spring, POST	43	58	15	7
	Glufosinate	Fall + Spring, POST	1	35	27	9
Oryzalin (0.75 lb/a)	Glyphosate	Fall	0	5	32	11
	Glyphosate	Spring, PRE	4	6	33	12
	Glyphosate	Spring, POST	4	65	18	8
	Glufosinate	Spring, POST	3	30	30	11
	Glyphosate	Fall + Spring, PRE	1	10	33	12
	Glyphosate	Fall + Spring, POST	5	58	19	7
	Glufosinate	Fall + Spring, POST	1	45	28	10
$LSD_{0.05}$			6	13	8	2

[a] Glyphosate and glufosinate applied at 0.75 lb/a.
[b] Fall = all residual applied in fall; Spring = all residual applied in spring; Fall + Spring = half residual applied in fall, half applied in spring; PRE = preemergence; POST = postemergence.

Table 3. 'Merry Widow' tulip bulb yield after treatment with various herbicide combinations and timings.

Residual herbicide	Nonselective herbicide[a]	Timing[b]	Total bulb number	Total bulb weight	Average bulb weight
			no./plot	g/plot	g/bulb
Thiazopyr (0.75 lb/a)	Glyphosate	Fall	149	796	5.3
	Glyphosate	Spring, PRE	143	664	4.6
	Glyphosate	Spring, POST	122	480	4.1
	Glufosinate	Spring, POST	111	427	4.0
	Glyphosate	Fall + Spring, PRE	146	680	4.7
	Glyphosate	Fall + Spring, POST	134	523	4.0
	Glufosinate	Fall + Spring, POST	132	527	4.0
Diuron (3.2 lbs/a)	Glyphosate	Fall	179	1129	6.3
	Glyphosate	Spring, PRE	157	796	5.1
	Glyphosate	Spring, POST	124	634	5.2
	Glufosinate	Spring, POST	115	465	4.2
	Glyphosate	Fall + Spring, PRE	167	839	5.0
	Glyphosate	Fall + Spring, POST	139	619	4.4
	Glufosinate	Fall + Spring, POST	150	689	4.7
Isoxaben (0.5 lb/a)	Glyphosate	Fall	180	843	4.7
	Glyphosate	Spring, PRE	129	778	6.0
	Glyphosate	Spring, POST	116	434	3.8
	Glufosinate	Spring, POST	122	465	3.9
	Glyphosate	Fall + Spring, PRE	167	937	5.6
	Glyphosate	Fall + Spring, POST	154	682	4.5
	Glufosinate	Fall + Spring, POST	121	565	4.8
Pendimethalin (3.0 lbs/a)	Glyphosate	Fall	183	991	5.4
	Glyphosate	Spring, PRE	191	1007	5.3
	Glyphosate	Spring, POST	133	494	3.8
	Glufosinate	Spring, POST	120	471	3.9
	Glyphosate	Fall + Spring, PRE	181	961	5.3
	Glyphosate	Fall + Spring, POST	129	479	3.8
	Glufosinate	Fall + Spring, POST	145	549	3.8
Oryzalin (0.75 lb/a)	Glyphosate	Fall	175	913	5.3
	Glyphosate	Spring, PRE	166	930	5.6
	Glyphosate	Spring, POST	137	549	4.0
	Glufosinate	Spring, POST	128	553	4.3
	Glyphosate	Fall + Spring, PRE	166	985	6.0
	Glyphosate	Fall + Spring, POST	145	561	3.9
	Glufosinate	Fall + Spring, POST	123	521	4.7
$LSD_{0.05}$			33	180	1.0

[a] Glyphosate and glufosinate applied at 0.75 lb/a.
[b] Fall = all residual applied in fall; Spring = all residual applied in spring; Fall + Spring = half residual applied in fall, half applied in spring; PRE = preemergence; POST = postemergence.



Spring PRE application of pendimethalin + glyphosate

POST application of pendimethalin + glufosinate

POST application of pendimethalin + glyphosate

Based on single-season results, the following observations can be made:

(1) Fall treatments of residual herbicide + glyphosate were the safest for all bulb types, although weed control with isoxaben was poor by springtime.

(2) Combinations with glyphosate applied all PRE in the spring to tulips were generally safe, except for isoxaben (foliar burn) and diuron (yield response).

(3) Split isoxaben and oryzalin applications with glufosinate (POST) to tulips were generally safer than with glyphosate (POST).

(4) Spring applications of diuron to all bulb types should be used with caution.

(5) Pendimethalin, oryzalin, and thiazopyr combinations applied in the spring were hard on iris.

This study is being repeated in 2001-02 to verify these results.