Post-bloom weed control in tulip (2004-05)

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Two ornamental bulb studies were conducted at WSU NWREC during 2005: a cover crop trial and an Aquacap/Outlook trial. Plant material for this study was kindly donated by Washington Bulb Co. and funds were provided by the Washington Bulb Commission, BASF, and the Washington Commission for Pesticide Registration.

Cover crop trial.

Cover crops, including white mustard, winter rapeseed, hairy vetch, and buckwheat, were planted in the August prior to bulb planting. These were contrasted with plots planted to green pea to simulate a pea crop grown prior to bulbs. Half of the cover crop plots were killed with Roundup about two weeks prior to incorporation, while the other half were only tilled. The cover crops were allowed to decompose for three weeks, after which 'Negrita' tulip, 'Standard Value' daffodil, and 'Blue Diamond' iris were planted into the plots (October, 2004). Cover crop plots were either treated with diuron or not. Plots which had been planted to peas were then seeded with winter wheat, winter rye, winter barley, buckwheat, white mustard, or winter rapeseed. These plots were then killed with Roundup alone or with diuron either in December or January. Plots were rated for weed control April 4 and May 9, 3005, flower number and height measured at full bloom, and number and weight of bulbs determined at harvest (June-July). The statistical design for this trial was a randomized complete block design with three replicates. Means were separated using Fisher=s Protected LSD (P = 0.05).

Aquacap/Outlook trial.

'Negrita' tulip was planted in October, 2004 and various rates and timings of Aquacap and Outlook were applied (preemergence, November and January). Roundup was mixed with the products at both timings to kill emerged weeds at the time of application. Weed control was rated April 4, May 9, and June 6 and flower height and number were measured at full bloom. The statistical design for this trial was a randomized complete block design with three replicates. Means were separated using Fisher=s Protected LSD (P = 0.05).

Results:

Cover crop trial.

While there were major differences in emergence of bulb foliage among the plots, this emergence did not track with plow-down or cover crop choice, with Roundup use, or with diuron use (data not shown). Poor emergence was particularly notable among daffodil and iris. The variable emergence may have been due to high water table during winter (drain line failure), the use of netting around bulbs which trapped foliage in the "bag", or a combination of both.

Plow-down crop choice, cover crop choice, or species of ornamental bulb did not significantly affect weed control, so the data were pooled across cover crops and bulb type. Weed control was affected by cover crops vs. plow-down crops (Table 1), by Roundup use (Table 2), and by diuron use (Table 3).

Weed control in April was maximized when cover crops were planted just following bulb planting or when cover crops were not used (Table 1). Using a plow-down crop resulted in a lower level of weed control. The May weed control rating was similar, although the response with cover crop did not differ from that of plow-down crop or no cover crop. Since there was not a significant difference in cover crop vs. no cover crop at either evaluation time, this response is probably due more to herbicide (diuron and Roundup) used in December or January than to an effect of the cover crop itself. These data indicate that neither plow-down crops grown before bulb planting nor cover crops grown after bulb planting improves weed control in bulbs.

Table 1. Effect of cover cropping on weed control in ornamental bulbs.

Treatment	Weed control[a]	
	April 4, 2005	May 9, 2005
	%	%
Plow-down crop	87 b	80 b
Cover crop	97 a	86 ab
No cover crop	99 a	91 a

[a]Means from the same date of evaluation followed by the same letter are not statistically different.

April and May weed control was similar in plots that were not sprayed with Roundup after bulb planting compared to plots where Roundup was applied to the plow-down crop (Table 2). In a similar manner, Roundup applied in either December or January provided statistically similar levels of weed control at both evaluation timings. These data show that Roundup applied preemergence to bulb foliage in December or January provides acceptable weed control through May. Roundup applied prior to bulb planting, or not at all, resulted in fair to poor weed control by early May.

Table 2. Effect of Roundup applied at three different timings on weed control in ornamental bulbs.

Treatment	Weed control[a]	
	April 4, 2005	May 9, 2005
	%	%
Roundup (prior to plow-down)	87 b	79 b
Roundup in November	96 a	84 ab
Roundup in January	99 a	89 a
No Roundup	87 b	81 b

[a]Means from the same date of evaluation followed by the same letter are not statistically different.

Weed control in April was maximized in four cases (1) when diuron was used in addition to a plow-down crop, (2) diuron used in addition to a cover crop, (3) diuron used without a cover crop, and (4) when neither diuron nor cover crops were used (Table 3). In case #4, the high level of weed control observed was certainly due to Roundup being used. No diuron after incorporation of a plow-down crop gave numerically the poorest weed control (75%) in April.

Variability in weed control among the plots resulted in no significant differences between treatments by May, although the trends observed in April were still apparent (Table 3). Weed control in May without diuron was poorer than in April in all cases.

Table 3. Effect of diuron and cover cropping on weed control in ornamental bulbs.

Treatment	Weed control[a]			
	With diuron		No diuron	
	April 4	May 9	April 4	May 9
	%	%	%	%
Plow-down crop	97 ab	94	75 d	63
Cover crop	100 a	97	95 b	74
No cover crop	100 a	99	98 a	82

[a]Means from the April 4 followed by the same letter are not statistically different; means from May 9 were not statistically different.

Bulb numbers and weights resulting from these cover crop and herbicide treatments are still being analyzed at the time of this writing. Data will be presented during the session.

Aquacap/Outlook trial.

Weed control in early April was excellent for all weed species (ranging from 88 to 100%)(Table 4). Control of shepherd's-purse and hedgemustard had fallen significantly by early May for most treatments, however, ranging from 40 to 78% for all treatments except Aquacap + Outlook applied twice (fall fb spring). Pineappleweed control in May was still good, ranging from 72 to 100% on that evaluation. Control of all three weed species was generally inadequate by June, except for Aquacap + Outlook applied twice, ranging from 27 to 78% by June 6. Control with Aquacap + Outlook applied twice remained at 100% for all three weed species during the duration of this study.

Flower number did not significantly differ among treatments or the untreated check in this trial, ranging from 28 to 34 flowers per yard of row (Table 4). There was no obvious impact of herbicides on flower color or shape. Flower heights differed statistically across treatments, but none differed significantly from heights of untreated tulips (Table 4). This indicates that herbicides likely did not greatly impact flower height (a common result of herbicide injury is a shortening of flower stems), although several treatments resulted in taller flowers than when tulips were treated with Aquacap + Outlook twice. Even so, flower stem length was acceptably long in all treatments.

Table 4. Weed control, flower number, and flower height of tulips treated with Aquacap, Outlook, or a combination of both products.

Treatment[a]	Rate[a]	Timing[a,b]	Shepherd's-purse control			Hedgemustard control			Pineappleweed control			Flower number	Flower height
			April 4	May 9	June 6	April 4	May 9	June 6	April 4	May 9	June 6		
	pts/a		%	%	%	%	%	%	%	%	%	per plot	cm
1. Aquacap	4.2	Fall	91	40	20	91	58	27	88	72	32	30.7	48.4
2. Aquacap	4.2	Spring	90	43	27	92	50	40	97	82	30	31.3	48.8
3. BAS 65902	4.1	Fall	94	48	13	91	50	20	96	78	55	32.7	46.5
4. BAS 65902	4.1	Spring	99	60	30	97	63	27	99	87	68	33.0	48.5
5. Aquacap fb	4.2 fb	Fall fb	96	65	30	99	65	58	98	87	57	28.3	48.6
Aquacap	4.2	spring											
6. Aquacap + Outlook fb	4.2 + 2.0 fb	Fall fb	100	100	100	100	100	100	100	100	100	27.7	44.9
Aquacap + Outlook	4.2 + 2.0	spring											
7. Aquacap + Outlook fb	4.2 + 2.0 fb	Fall fb	99	73	17	99	78	68	99	97	78	32.7	47.7
Aquacap	4.2	spring											
8. BAS 65902 fb	4.1 fb	Fall fb	98	62	63	99	65	47	100	96	73	34.0	48.5
BAS 65902	4.1	spring											
9. BAS 65902 fb	6.3 fb	Fall fb	98	60	53	95	58	50	96	88	63	33.3	49.1
Aquacap	4.2	spring											
10. Aquacap fb	4.2 fb	Fall fb	99	63	35	98	48	28	100	95	78	27.7	47.1
BAS 65902H	4.1	spring											
11. Untreated check	---	---	85	37	17	91	63	17	90	30	48	30.0	47.7
$LSD_{0.05}$	---	---	8	27	49	ns	24	41	7	27	34	ns	3.1

[a]fb = "followed by" (e.g., sequential application of herbicides). Aquacap is microencapsulated pendimethalin, Outlook is dimethenamid-p, and BAS 596 02 H is a premix of microencapsulated pendimethalin and microencapsulated dimethenamid-p. All treatments were mixed with 0.75 lbs ae glyphosate/acre to control emerged weeds.

[b]"Fall" applications were made November 17, 2004; "spring" applications were made PRE January 21, 2005.