

TITLE: Testing of pendimethalin and pyrazon for tolerance in tulip

PROJECT CATEGORY: Old Mandate 100% (non GLP); New Mandate 0%

PROJECT DURATION: Start date: October, 2005 End date: September, 2006

TOTAL PROJECT COST: \$6,446 WSCPR request: \$3,223 Co-funding: \$3,223

1. PROBLEM DESCRIPTION:

Tulip, daffodil, and bulbous iris are grown on about 1,600 acres annually in western Washington with a gross value of over \$12 million. These bulb crops are, however, poor competitors with weeds because of generally slow early-season growth and shallow root systems. Previous research at the WSU Northwestern Washington Research and Extension Center (NWREC) at Mount Vernon has demonstrated that weed competition may decrease bulb yield by as much as 41% and reduce bulb size by up to 32%. Significantly, these weedy fields also abundantly produce weed seed, perpetuating the likelihood of weed problems in all subsequent crops.

Tulips are usually produced in hills to improve water drainage from the root zone of the bulb. Cultivation of weeds is impossible due to wet soils from planting (September through October) until well after flowering, and is not generally advisable if damage to bulb root systems is to be avoided from flowering until bulb harvest. Consequently, weed control in tulip has focused on herbicides. Currently, five herbicides are registered for selective control of broadleaf weeds in field-grown tulip: oryzalin alone (Surflan) or combined with benfen (XL 2G), napropamide (Devrinol), s-metolachlor (Pennant Magnum), and, most recently, pendimethalin (Aquacap or Pennant). To avoid excessive herbicide movement, these products are usually applied after rains have settled the soil around the tulip bulbs, generally within three or four weeks of bulb planting. Since these products provide only preemergence weed control, they often are mixed with non-selective glyphosate (Roundup and others) or paraquat (Gramoxone Max) to kill emerged weeds. Because they can injure tulip if applied to foliage, glyphosate or paraquat can be used only until emergence of foliage, usually in February.

In testing at WSU NWREC from 1998-2005 (some of these studies funded by WSCPR), pendimethalin up to 3.0 lb ai/a has provided excellent weed control and only slight crop injury when applied all in the fall, all in the winter (just prior to emergence of tulip foliage), or split between the two application timings. This testing was done using both the old 3.3 EC pendimethalin formulation (Pendulum), and more recently, the encapsulated formulation of pendimethalin that improves mixing with water, reduces staining of equipment, and nearly eliminates chemical odor (Aquacap). A second herbicide manufactured by BASF is pyrazon, sold under the trade name of Pyramin for use in sugar beet, and in red beet and Swiss chard seed crops. The specialty crop label of pyrazon is sold by MicroFlo through arrangement with BASF, and there is interest by BASF (Dr. Kathie Kalmowitz) to test pyrazon more thoroughly in tulip

production. She has requested pyrazon be tested with and without pendimethalin in tank mixture and in various sequences in tulip this season.

2. RANKING AND PRIORITIZATION: General Criterion II (Project advances a product toward registration or enhances an IPM program), Category C (Significance to Local or Regional Economy), Part IV (Registration of an additional pest control tactic).

3. PROJECT DESCRIPTION:

A. Personnel: Tim Miller, Extension Weed Scientist, Washington State University NWREC, 16650 State Route 536, Mount Vernon, WA 98273; (360) 848-6138, (360) 848-6159 (FAX), twmiller@wsu.edu

B. Objectives: To evaluate the herbicides pyrazon and pendimethalin for weed control and crop safety in tulip.

C. Procedures: Tulip bulbs will be planted into plots measuring 3 by 8 feet, each containing one row of tulips. Pyrazon and/or pendimethalin will be applied at several rates and timings (see Table). Since neither herbicide provides control of emerged weeds, glyphosate at 0.75 lbs ae/a will be applied in mixture with these products. Percent weed control and crop injury will be estimated two times after emergence of tulip foliage and prior to flowering, and once after flowering but prior to bulb harvest. Flower number and stem height will be measured at full bloom. Bulb yield (number and weight) will be determined when bulb foliage has died back. The experimental design will be a randomized complete block design with four replicates (10 treatments + untreated check = 44 total treatments).

Table. Herbicide treatments to be tested in tulip.

Treatment	Trade name	Rate (lbs ai/a)	Timing
1. Pendimethalin	Aquacap	2.0	Fall
2. Pendimethalin	Aquacap	2.0	Spring
3. Pyrazon	Pyramin	2.5	Fall
4. Pyrazon	Pyramin	2.5	Spring
5. Pendimethalin + pyrazon	Aquacap + Pyramin	2.0 + 2.5	Fall
6. Pendimethalin + pyrazon	Aquacap + Pyramin	2.0 + 2.5	Spring
7. Pyrazon fb pendimethalin	Pyramin fb Aquacap	2.5 fb 2.0	Fall fb spring
8. Pendimethalin fb pyrazon	Aquacap fb Pyramin	2.0 fb 2.5	Fall fb spring
9. Pendimethalin + pyrazon fb	Aquacap + Pyramin fb	1.0 + 1.25 fb	Fall fb
Pendimethalin + pyrazon	Aquacap + Pyramin	1.0 + 1.25	Spring
10. Pendimethalin + pyrazon fb	Aquacap + Pyramin fb	2.0 + 2.5 fb	Fall fb
Pendimethalin + pyrazon	Aquacap + Pyramin	2.0 + 2.5	Spring
11. Handweeded check	---	---	---

fb = "followed by" (e.g., sequential application of herbicides)

All treatments to be mixed with 0.75 lbs ae glyphosate/acre to control emerged weeds

D. Time Frame: Tulip bulbs will be transplanted in October, 2005. Herbicides will be applied approximately three to four weeks after transplanting after rains have settled the soil around the bulbs and root growth has begun (early November, 2005) and in late winter just prior to emergence of tulip foliage (late January to early February, 2006).

Flower measurements will occur in April, 2006 and efficacy and crop safety ratings in February, March, and June. Bulb harvest will be during July, 2006. The project will be completed in September, 2006.

4. PROJECT BUDGET

Expenditure	WSCPR (Request)	Matching (CASH or IN-KIND) ⁴			TOTAL COST
		Source: BASF	Source: WA Bulb	Source:	
		Amount (CASH)	Amount (IN-KIND)	Amount (IN-KIND TIME)	
Salaries ¹	\$ 1,500	\$ 1,000	\$ 0	\$ 0	\$ 2,500
Employee Benefits (37.5% and 11%)	680	490	0	0	938
Temporary or hourly workers ²	1,000	1,000	0	0	2,320
Travel ³	0	90	0	0	90
Equipment	0	0	0	0	0
Other (bulbs, field supplies)	43	420	223	0	598
Other (specify)	0	0	0	0	0
Total	\$ 3,223	\$ 3,000	\$ 223	\$ 0	\$ 6,446

¹Salary for A/P scientific assistant (0.7 FTE funded by WSU, 0.3 FTE funded by program).

²Temporary workers (200 hrs at \$10/hr); benefits (11%) included in employee benefit line total.

³Travel is for plot establishment, maintenance, and harvest.

⁴Match provided by BASF Corporation (cash) and Washington Bulb Company, Inc. of Mount Vernon, WA (in-kind donation of tulip bulbs, value of \$223).

Has this budget been reviewed for accuracy? Yes
By Whom? Pat King, WSU NWREC

Projected Expenditures (by quarter)

Time Period	Oct-Dec 2005	Jan-Mar 2006	Apr-Jun 2006	Jul-Sep 2006
WSCPR Funds	\$ 800	\$ 500	\$ 500	\$ 1,423
Total Funds	\$ 1,600	\$ 1,000	\$ 1,000	\$ 2,846

Has this project been funded previously by WSCPR? **No**