

Research Report to the
Oregon Processed Vegetable Commission
and the
Agricultural Research Foundation

Title: Goal Impregnated Fertilizer and Pyridate for Postemergence Weed Control In Transplanted and Direct Seeded Crucifers

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Project status: continuing

Project Funding: \$3200.

Objectives

1. Evaluate potential of using fertilizer impregnated with Goal for weed control in seeded broccoli and cauliflower.
2. Improve weed control efficiency of Goal on transplanted cauliflower.

Progress

1. Goal Impregnated Fertilizer and Pyridate for Postemergence Weed Control in Broccoli and Cauliflower.

Trifluralin was incorporated into the soil on the entire plot to suppress weeds until the postemergence fertilizer was applied. Broccoli was planted with a vacuum seeder on June 13 and cauliflower on July 22, 1996. Goal herbicide was uniformly impregnated on fertilizer (15-15-15) by hand mixing. The impregnated fertilizer was spread over emerging broccoli plants at cotyledon, 2, and 4 leaf stages of growth. The fertilizer spreader was calibrated to deliver 330 lbs of fertilizer per acre and 0.25 or 0.50 lbs ai Goal/acre.

Pyridate was applied postemergence without crop oil concentrate over 2 and 6 leaf broccoli. Weed emergence and crop injury were estimated at 4 WAP. The broccoli and cauliflower were not harvested because of a serious club root infection in the plot.

Broccoli. Nightshade was the primary weed that emerged and weed control was poor as nightshade is moderately tolerant to Goal (Table 1). Weed control diminished rapidly as the herbicide was applied later in the season. The herbicide treated fertilizer must be applied before weeds emerge so that it can distribute from the prills and establish a soil barrier before weeds

weeds emerge so that it can distribute from the prills and establish a soil barrier before weeds break the surface. Crop injury from the Goal impregnated fertilizer was very low in the broccoli trial.

Pyridate effectively controlled weeds but moderately injured the broccoli when applied at the 2-true leaf stage (Table 1). Pyridate is primarily a broadleaf contact herbicide and application timing is very critical for proper weed control as demonstrated by the poor weed control achieved when applied to 6 leaf broccoli. Treflan did not adequately suppress weeds until pyridate was applied to 6 leaf broccoli, and pyridate only slightly reduced weed growth.

Cauliflower. The initial Goal-plus-fertilizer treatment was applied just as the cauliflower was emerging. Applying fertilizer at this stage significantly increased injury to cauliflower both in biomass accumulation and the number of surviving plants (Table 2). However, even at the one leaf stage, injury to the cauliflower was much greater than in the broccoli treatment. One factor that may explain this difference was that some of the fertilizer had a high concentration of fines, and this dust may have adhered to the plants more than in the broccoli trial. Weed control was exceptional in some of the treatments. Yield was not taken in this trial because club root also infected this planting.

2. Timing of Goal Application for Weed Control in Cauliflower

Goal was applied pre-transplant surface to soil near Mollala, either in the afternoon or evening, before or after rototilling, and at three rates on July 24, 1996. Afternoon soil surface temperatures were near 127 F on dry soil. The four treatments based on rototilling timing and afternoon vs evening application established a moisture gradient at the soil surface.

Emerged weeds were counted on September 6, six weeks after Goal application. Weed control was estimated again on Oct. 11, eleven weeks after treatment by comparing weed density and growth to untreated check strips within the field.

Ideal conditions were available to test the hypothesis that soil moisture present at application determines efficacy of Goal herbicide. The soil had been last worked one week prior to application. A brief period of rain was followed by very hot and dry conditions and produced moist soil beneath a very dry soil surface. The rototilled soil dried very quickly during the afternoon. Herbicides were applied immediately behind the rototiller and the final treatment was applied within 10 minutes after rototilling.

The most notable effect on weed control at 6 weeks after treatment was caused by herbicide rate (Table 4). The highest rate (0.5 lbs ai/ac) of Goal completely controlled pigweed across all soil management treatments, but a few nightshade and lambsquarter escaped. Weed control estimates for nightshade were highly variable and did not conform to trends for lambsquarter and pigweed.

At the low rate of Goal (0.15 lbs ai/ac) however, Goal application to soil that was rototilled just before the Goal was applied significantly reduced pigweed emergence compared to Goal that was applied to dry soil (Table 5). The trend was not consistent for lambsquarter and

total weed emergence. Goal applied at 0.15 lbs ai/ac in the afternoon to recently rototilled soil had the lowest total weed emergence overall at six weeks after application.

A second visual estimation at 11 weeks after treatment again indicated that herbicide rate effects were much more important than application timing for all species evaluated (Table 6). At the lower rate, pigweed and lambsquarter were controlled best by Goal applied in the evening (Table 7, Figure 1).

The soil surface was very hot and dry when Goal was applied at mid-afternoon. The potential of Goal to adsorb to soil particles would be very high under these conditions. Although, Goal losses to volatilization are usually considered to be very low, the soil temperature recorded at herbicide application of 127 F would certainly test this assumption. Overall weed emergence indicates that applying Goal to recently tilled soil improves weed control, but the effect is not consistent between species when applied in the afternoon or evening. Though the best practice can not be easily discerned from this data set because of variable responses within weed species, the least efficient use of Goal is very clear. Reduced efficacy of Goal can be expected if applied to very dry and hot soil at midday.

Summary

Weed control with goal impregnated fertilizer ranged from excellent to poor depending primarily on application timing. When applied at the full cotyledon stage, crop injury was low and weed control acceptable at the higher rate of Goal.

Pyridate may be more suitable for postemergence control than impregnated fertilizer because of better weed control potential, although injury could be a concern when applied to crucifers with less than two leaves.

Applying Goal to dry and hot soil significantly reduces its weed control potential. Rototilling just before application or applying Goal in the evening improves control.

Table 1. Impregnated Goal fertilizer and pyridate for weed control in broccoli, Veg Res farm, 1996.

Herbicide	Rate	Timing	Weed control (4 WAP)	Injury (4 WAP)
			%	%
1. Goal impregnated fertilizer	0.25	Coty	23	0
2. Goal impregnated fertilizer	0.5	Coty	73	0
3. Goal impregnated fertilizer	0.25	2 leaf	0	0
4. Goal impregnated fertilizer	0.5	2 leaf	53	0
5. Goal impregnated fertilizer	0.25	4 leaf	0	7
6. Goal impregnated fertilizer	0.5	4 leaf	27	3
7. Pyridate	0.47	2 leaf	83	7
8. Pyridate	0.94	2 leaf	92	50
9. Pyridate	0.47	6 leaf	17	13
10. Pyridate	0.94	6 leaf	20	7
11. Check: no herbicide	0.47		0	0
FPLSD (0.05)			32	9

Table 2. Survival and growth of cauliflower with goal impregnated fertilizer

Herbicide	Rate	Timing	Surviving plants	Growth reduction
			no./plot row	%
1. Goal impregnated fertilizer	0.25	Emerging	33	68
2. Goal impregnated fertilizer	0.5	Emerging	6	92
3. Goal impregnated fertilizer	0.25	Full cotyledon	29	40
4. Goal impregnated fertilizer	0.5	Full cotyledon	31	33
5. Check	-	-	37	2
FPLSD (0.05)			22	8

Table 3. Fertilizer and pyridate application data on broccoli and cauliflower.

	Impregnated fertilizer 1	Impregnated fertilizer 2	Impregnated fertilizer 3	Pyridate #1	Pyridate #2
Broccoli					
Application date	6/24/96	7/3/96	7/12/96	7/4/96	7/12/96
Application timing (crop stage)	Cotyledon	2 full leaves	6 leaves	2 full leaves	6 leaves
Cauliflower					
Application date	7/30/96	8/2/96			
Application timing (crop stage)	Just emerging	Full cotyledon			
Fertilizer mixture	0.25 rate: 9.72 ml Goal/2.50 kg 15-15-15 fertilizer				
	0.50 rate: 19.44 ml Goal/2.50 kg 15-15-15 fertilizer				

Table 4. Weed emergence in response to goal herbicide application timing and rate 6 weeks after planting.

Timing	Herbicide rate	Pigweed	Nightshade	Lambsquarter	Total
	-lbs ai/ac-	no/24 ft of inter-row area			
1. Afternoon, untilled	0.15	8	8	5	21
2. Afternoon, untilled	0.25	0	3	2	5
3. Afternoon, untilled	0.50	0	1	1	2
4. Evening, untilled	0.15	4	11	2	17
5. Evening, untilled	0.25	1	2	1	4
6. Evening, untilled	0.50	0	1	1	2
7. Afternoon, tilled	0.15	0	1	4	5
8. Afternoon, tilled	0.25	1	1	1	3
9. Afternoon, tilled	0.50	0	0	0	0
10. Evening, tilled	0.15	0	12	2	14
11. Evening, tilled	0.25	0	3	0	3
12. Evening, tilled	0.50	0	1	0	1
FPLSD (0.05)		3	ns	2	10

Table 5. Weed emergence in response to low rates of Goal at four application timings, 6 weeks after planting.

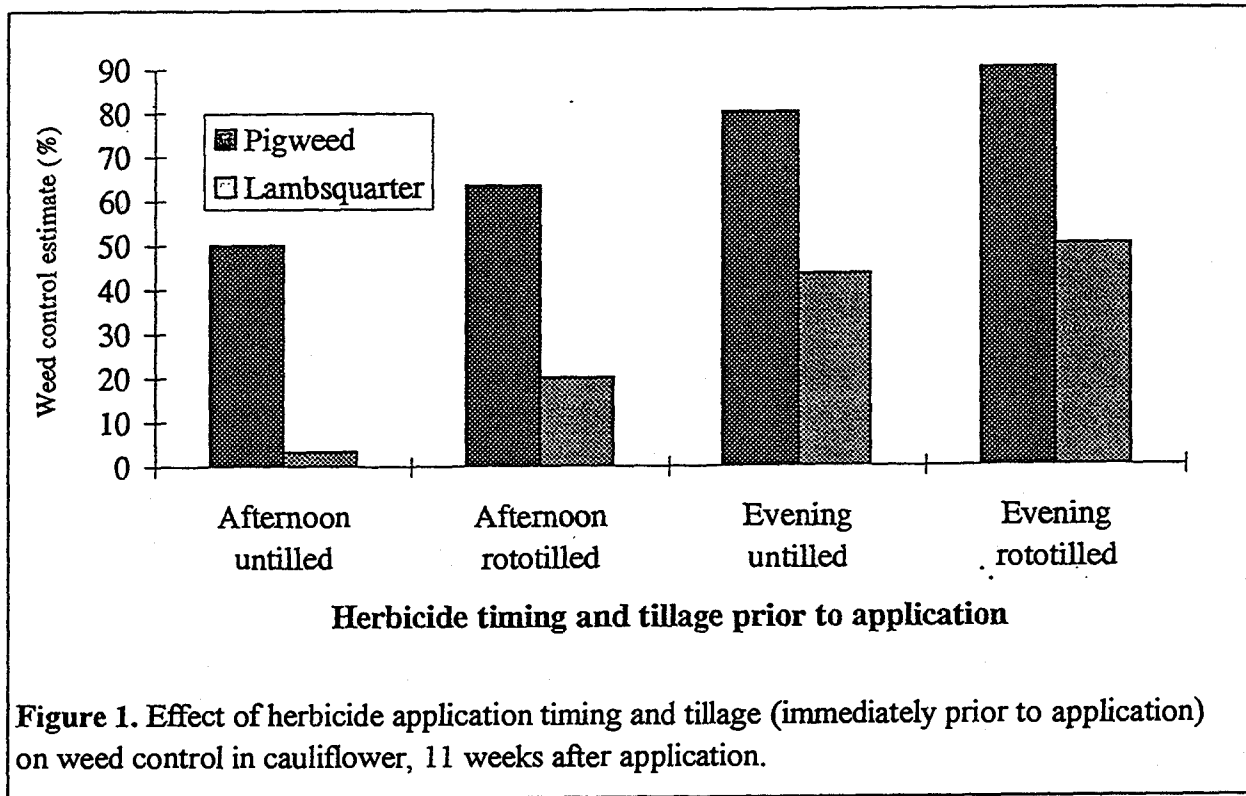
Timing	Herbicide rate	Pigweed	Nightshade	Lambsquarter	Total
	-lbs ai/ac-	no/24 ft of inter-row area			
1. Afternoon, untilled	0.15	8	8	5	21
4. Evening, untilled	0.15	4	11	2	17
7. Afternoon, tilled	0.15	0	1	4	5
10. Evening, tilled	0.15	0	12	2	14
FPLSD (0.05)		3	ns	2	10

Table 6. Weed control at 11 weeks after planting in cauliflower.

Timing	Herbicide rate	Pigweed	Nightshade	Lambsquarter	Total
	-lbs ai/ac-				
1. Afternoon, untilled	0.15	50	47	3	30
2. Afternoon, untilled	0.25	88	90	70	77
3. Afternoon, untilled	0.50	97	97	97	93
4. Evening, untilled	0.15	80	25	43	33
5. Evening, untilled	0.25	100	87	90	87
6. Evening, untilled	0.50	100	100	67	92
7. Afternoon, tilled	0.15	63	50	20	43
8. Afternoon, tilled	0.25	97	87	90	82
9. Afternoon, tilled	0.50	100	97	100	98
10. Evening, tilled	0.15	90	77	50	60
11. Evening, tilled	0.25	98	90	93	80
12. Evening, tilled	0.50	100	100	100	95
FPLSD (0.05)		32	30	36	26

Table 7. Weed emergence in response to low rates of Goal at four application timings, 11 weeks after planting..

Timing and tillage	Herbicide rate	Pigweed	Nightshade	Lambsquarter	Total
	-lbs ai/ac-	----- % -----			
1. Afternoon, untilled	0.15	50	47	3	30
4. Evening, untilled	0.15	80	25	43	33
7. Afternoon, tilled	0.15	63	50	20	43
10. Evening, tilled	0.15	90	77	50	60
FPLSD (0.05)		32	30	36	26



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