Horticultural Weed Control

1996 Report

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Not intended nor authorized for publication

Data contained in this report are compiled annually as an aide to complete minor crop registrations for horticultural crops. Data are neither intended nor authorized for publication. Information and interpretation cannot be construed as recommendations for application of any herbicide mentioned in this report.

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WEED AND SOIL ECOLOGY

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The Report

Results from vegetation management trials involving horticultural crops conducted during the past year are compiled and reported by faculty members of the Oregon Agricultural Experiment Station, the Oregon State Extension Service, and colleagues who cooperated from adjacent states. This work was conducted throughout Oregon and involved many individuals. This work has expanded beyond conventional herbicide technology and includes research on the impacts of cover crop vegetation management on weed control, techniques such as propane flaming for selective weed control, and the effects of vegetation management strategies on other pests such as symphylans.

The contributors sincerely appreciate the cooperative efforts of the many growers, university employees, and local representatives of the production and agrochemical industries. We also gratefully acknowledge financial assistance from individual growers, grower organizations, and companies which contributed to this work.

Information and Evaluation

Crops were grown at the experimental farms using accepted cultural practices (within the limits of experimentation) or trials were conducted on growers' fields. Most experiments were designed as randomized complete blocks with three to five replications. Herbicide treatments were applied uniformly with precision plot sprays. Unless otherwise indicated, preplant herbicide applications were incorporated with a PTO horizontal rotary tiller operated at a depth of approximately two inches. After critical application stages, crops were irrigated with overhead sprinklers at weekly intervals or as needed.

Crop and weed responses are primarily visual evaluations of stand reduction (SR) and growth reduction (GR), ranging from 0-100 with 100 as the maximum response for each rating, or an over-all rating of 0-10 for crop response or control of specific weed species with 10 being complete control of the weed or good crop vigor (no injury). Additional data such as crop yields are reported for certain studies and may be reported in either English or metric systems.

Abbreviations

DAP	Days after planting
WBP	Weeks before planting
WAP	Weeks after planting
PRE/PES	Preemergence herbicide application/preemergence surface
PPI	Preplant incorporated herbicide application
PPS	Preplant surface
POSTB	Postemergence broadcast herbicide application
POSTD	Postemergence directed herbicide application
ai/ac	Active ingredient per acre

HERBICIDES TESTED

Common Name	Manufacturer	Trade Name	Page Number
Acetochlor	Monsanto	Harness	45, 53, 63, 85, 93
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Glyphosate	Monsanto	Roundup	77, 81, 115, 119, 127
Halosulfuron	Monsanto	Battalion	45, 63, 85, 93
Lactofen	Valent	Cobra	1, 5, 9, 15, 25
Linuron	Du Pont	Lorox	97, 99, 103, 105
Metam sodium	Zeneca	Vapam	141
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Table 1. Temperature and precipitation at Hyslop Research Farm, Corvallis, OR, 1996.

	April				May				June				July			
Day	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)
1	55	46	1	0.46	72	46	9	0.01	72	51	12		82	50	16	
2	61	44	3	T	64	45	5		80	52	16		86	54	20	
3	55	35	0	0.04	58	33	0	0.02	86	54	20		84	54	19	
4	62	36	0		53	31	0	0.11	80	47	14		79	52	16	
5	71	43	7		60	32	0		70	49	10		73	48	11	
6	75	44	10		65	39	2		76	46	11		77	50	14	
7	78	49	14		66	36	1	T	84	49	17		85	55	20	
8	79	46	13		58	30	0	0.06	73	47	10		93	56	25	
9	71	49	10	T	60	34	0		72	43	8		87	54	21	
10	63	44	4	0.02	61	41	1		67	41	4		75	48	12	
11	54	46	0	0.02	62	45	4		73	47	10		82	48	15	
12	52	41	0	0.74	68	52	10	0.01	71	46	9		90	55	23	
13	52	37	0	0.17	67	56	12	0.40	78	45	12		96	58	27	
14	62	41	2		66	54	10	0.26	73	43	8		99	60	30	
15	71	46	9		66	52	9	0.24	75	43	9		99	54	27	
16	65	44	5	0.19	66	46	6	0.10	73	43	8		85	45	15	
17	55	39	0	0.12	67	51	9	0.62	67	38	3		50	55	18	0.20
18	53	37	0	0.10	62	50	6	0.56	63	44	4	0.09	62	51	7	0.67
19	53	40	0	0.14	60	44	2	0.73	68	49	9	0.01	68	51	10	0.05
20	52	41	0	0.30	62	39	1	0.03	79	46	13		75	49	12	
21	55	42	0	0.27	65	43	4	0.30	76	42	9		78	58	18	
22	58		1	0.46	55	44	0	0.27	70	44	7		81	58	20	
23	57	49	3	0.70	59	45	2	0.14	75	52	14	0.38	94	62	28	
24	60	44	2	1.09	61	44	3	0.01	67	53	10	0.28	97	59	28	
25	61	46	4	0.03	71	46	9		68	52	10	0.01	95	56	26	
26	62	36	0	0.05	79	46	13		73	45	9		95	57	26	
27	61	38	0	0.03	68	38	3		80	54	17	T	97	59	28	
28	60	40	0		61	40	1		69	55	12	0.08	92	58	25	
29	67	43	5		61	46	4	0.06	71	46	9		83	58	21	T
30	71	44	8		62	47	5	0.05			10		91	57	24	
31					64	40	2						86	50	18	
Total			96	4.93			128	3.98			307	0.85			613	0.92

Table 1 Cont'd

	August				September				October				November			
	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)
1	84	48	16		77	49	13		74	51	13		58	31	0	
2	79	53	16	0.14	78	49	14		72	43	8		58	34	0	
3	71	52	12	T	75	46	11		74	49	12		52	37	0	
4	76	50	13		76	42	9		78	50	14		58	39	0	0.10
5	73	53	13		68	41	5	0.13	75	54	15	0.39	53	35	0	0.10
6	75	51	13		71	43	7		65	43	4		53	38	0	
7	81	55	18		78	45	12		71	47	0		54	40	0	0.25
8	92	54	23		83	48	16		81	49	15		55	39	0	
9	94	55	25		82	56	19		77	49	13		58	39	0	
10	97	56	27		78	50	14		82	52	17		47	40	0	
11	100	55	28		86	51	19		66	52	9	T	47	40	0	
12	76	53	15		83	54	19		66	43	5	T	55	41	0	
13	86	55	21		69	53	11		61	48	5	0.64	62	41	2	0.29
14	94	51	23		69	55	12	0.23	62	42	2	0.13	57	44	1	0.13
15	89	51	20		63	50	7	1.26	56	44	0	0.32	57	41	0	0.10
16	86	50	18		64	49	7	0.39	59	39	0	0.28	52	43	0	0.25
17	84	47	16		63	50	7	0.07	51	35	0	T	50	44	0	0.62
18	75	40	8		67	42	5		56	37	0	0.46	51	42	0	0.63
19	72	46	9		67	45	6	0.08	51	38	0	0.66	46	34	0	4.45
20	77	52	15		67	46	7		54	39	0	0.06	58	33	0	0.50
21	78	50	14		67	41	4		56	34	0		51	37	0	0.03
22	82	53	18		66	40	3	0.06	55	38	0	0.23	41	38	0	0.80
23	90	53	22		64	45	5		57	40	0	T	44	31	0	
24	93	61	27		72	40	6		56	43	0	0.76	50	35	0	0.51
25	93	61	27		71	43	7		60	44	2	0.87	59	37	0	0.25
26	83	58	21	T	74	48	11		56	32	0	0.05	50	39	0	0.02
27	74	55	15	T	79	45	12		51	33	0		50	40	0	0.29
28	76	49	13		83	47	15		56	38	0		55	45	0	0.59
29	85	52	19		84	46	15		50	38	0	0.47	52	37	0	0.12
30	92	56	24		78	52	15		52	35	0		48	38	0	0.02
31	82	48	15						61	41	1					
Total			556	0.14			307	2.22			141	5.32			2	10.20

Table 2. Temperature and precipitation at Salem, OR, 1996.

Day	May			June			July			August			September		
	Max T	Min T	Precip	Max T	Min T	Precip	Max T	Min T	Precip	Max T	Min T	Precip	Max T	Min T	Precip
1	62	46	0	80	50	0	86	51	0	79	49	0	78	47	0
2	55	36	0.08	87	53	0	83	56	0	71	55	0.2	73	46	0
3	52	36	0.05	78	51	0	79	54	0.02	74	54	0	75	48	0
4	60	32	0	69	50	0	72	52	0	73	52	T	66	46	0.1
5	65	36	0	77	50	0	77	42	0	73	55	0	69	45	0.01
6	64	36	0	84	48	0	86	52	0	81	47	0	74	45	0
7	57	35	0.03	73	52	0	94	54	0	94	53	0	81	48	0
8	59	31	0	72	49	0	86	56	0	95	57	0	81	50	0
9	60	34	0	68	49	T	76	55	0	97	55	0	78	55	0
10	62	42	0	74	43	0	82	49	0	99	58	0	85	48	0
11	65	46	T	71	47	0	90	53	0	75	51	0	82	53	0
12	66	52	0.23	79	43	0	96	57	0	87	54	0	66	54	0
13	64	55	0.06	73	47	0	99	60	0	92	56	0	66	56	0.03
14	65	54	0.03	75	45	0	98	62	0	88	57	0	61	56	0.95
15	65	52	0.04	72	43	0	85	56	0	85	49	0	66	50	0.52
16	66	47	0	68	45	0	78	50	0	82	52	0	64	50	0.23
17	62	51	0.82	62	42	0.04	59	54	0.69	74	46	T	66	48	0.01
18	62	48	0.43	68	45	T	67	52	0.16	70	45	0	66	43	0.04
19	62	44	0.01	80	47	0	73	55	0	77	45	0	68	51	0.02
20	64	40	0	76	46	0	76	52	0	76	54	0	66	45	0
21	56	48	0.81	69	47	0	82	58	0	83	49	0	65	41	0.04
22	59	45	0.38	71	47	0.18	96	59	0	92	51	0	64	42	0
23	59	47	0.11	69	53	0.21	98	62	0	95	52	0	73	41	0
24	72	44	0	65	52	0.31	95	62	0	94	58	0	72	41	0
25	78	46	0	73	51	0	95	56	0	81	61	0	74	39	0
26	67	49	0	78	47	0	95	59	0	72	60	T	79	45	0
27	63	39	0	69	56	T	92	60	0	73	55	0	82	46	0
28	60	46	T	68	53	0	80	62	0.03	83	50	0	82	49	0
29	60	47	0.1	77	46	0	91	59	0	91	54	0	78	47	0
30	63	45	T	82	48	0	85	58	0	80	56	T	70	52	0.01
31	70	41	0				83	52	0	77	50	0			
Total			3.18			0.74			0.90			0.20			1.96

Snap Bean Tolerance to Herbicides

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Objectives

Quantify snap bean tolerance to metolachlor, dimethenamid, and lactofen.

Methods

Snap beans were planted at the Vegetable Research Farm near Corvallis on June 7 and at a site near Lebanon on May 30, 1996 in 12 by 30 ft plots, with three replications. At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows, and PES herbicides were incorporated with 0.5 inches of irrigation 3 days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and snap beans planted on 24 inch rows (May 30). Three plots were added on one side of the trial to include the grower applied treatment of EPTC and lactofen. This treatment differed from the others in that ethoprop and EPTC were incorporated together. Ethoprop was not applied to the other treatments. Irrigation was not applied until nearly one week later, just as the beans were emerging. This may have aggravated lactofen injury on the beans as reported in Table 2.

A single between-row cultivation was used to reduce weed competition. Hand hoeing and pulling was not used because of potential negative impact on crop growth. The weed level at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis the general level was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

Snap beans were harvested from 6.6 ft or row at both sites and biomass weighed and plants counted. Snap bean pod yield was determined only at Corvallis, and pods collected from the replications of each treatment were combined and graded.

Results and Discussion

Corvallis (Table 1). Dimethenamid PPI injured snap beans more than when applied PES and more than metolachlor at 3 WAP. Snapbean yield was probably more a factor of weed control than tolerance to herbicides, however. Cultivation was used to control weeds in row middles but poor weed control with metolachlor (PPI) may have decreased yields. It is unclear why EPTC plus lactofen yielded nearly 1 ton less than the treatment with the highest yield of 11.1 tons/ac (metolachlor + EPTC + trifluralin). It is unlikely that weed competition decreased yield; weed control was nearly 100 percent at harvest in both treatments.

Lebanon (Table 2). Snap bean biomass may have been slightly reduced by dimethenamid PPI, and lactofen plus metolachlor PES. The EPTC treatment reduced biomass yield, and was probably not totally related to weed competition. Other treatments with much higher weed levels had higher yields. Of particular concern was the lactofen plus EPTC application that gave exceptional weed control but also had the lowest biomass yield. This treatment was applied by the grower and differed from the other treatments in that ethoprop was applied PPI with the EPTC.

Table 1. Herbicide impacts on snap bean yield, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Crop growth		At snap bean harvest				
			Emergence 6/21	Injury 7/5	Bean plants	Bean plant biomass	Pod yield	Grade	Total weed rating[1]
		lbs ai/ac	no./3 ft row	%	No./6.6' row	t/ac	t/ac	% 2-4	0= complete weed control
1. Dimethenamid	PPI	1.25	21	13	44	21.0	10.7	43	4
2. Dimethenamid	PES	1.25	24	5	41	20.2	10.2	44	2
3. Dimethenamid	PPI	2.50	20	10	36	18.2	10.6	51	-
4. Dimethenamid	PES	2.50	22	2	37	18.1	10.1	47	-
5. Metolachlor	PPI	2.00	21	3	36	16.6	9.6	42	10
6. Metolachlor	PES	2.00	25	0	39	19.7	8.9	44	13
7. Metolachlor	PPI	4.00	24	4	40	17.7	10.3	48	-
8. Metolachlor	PES	4.00	23	0	42	19.1	10.3	46	-
9. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.5 1.0	30	5	47	21.9	11.3	43	1
10. EPTC	PPI	3.50	26	0	41	21.9	9.1	45	14
11. Lactofen	PES	0.125	25	3	42	19.1	10.2	54	3
12. Lactofen	PES	0.188	20	2	40	16.6	10.1	46	6
13. Dimethenamid Lactofen	PES PES	1.20 0.125	23	0	49	19.5	10.7	46	0
14. Dimethenamid Lactofen	PES PES	0.75 0.188	25	2	44	19.4	11.0	43	0
15. Metolachlor Lactofen	PES PES	2.00 0.125	22	0	42	20.8	10.5	44	4
16. Metolachlor Lactofen	PES PES	1.0 0.188	25	7	44	19.7	10.7	50	0
17. EPTC Lactofen	PPI PES	3.5 0.188	26	2	49	15.9	10.1	47	1
18. Bentazon	EPOST	1.0	24	-	41	16.1	8.6	50	26
19. Clomazone	PES	0.5	26	2	45	20.0	8.6	53	8
20. No herbicide, one cultivation	-	-	22	0	43	15.3	6.4	61	30
21. No herbicide, two cultivations	-	-	24	0	43	15.4	7.9	52	-
FPLSD(0.05)			ns	7	ns	4.7	2.7	-	16

[1] Rating based on growth stage of weeds (rating of 3 ≅ 1 seed producing plant/ 6.6 ft of row). Data for 2X rates is not available but would ≅ 0.

Table 2. Tolerance of snap beans to herbicides, Lebanon, OR ,1996

	Herbicide	Timing	Rate	Emergence	Seedling injury rating[1]	Plants harvested	Biomass	Total weed rating[2]
			lbs ai/ac	no/m of row	10=all 0=none	no/2 m	t/ac	0= no weeds
1.	Dimethenamid	PPI	1.25	20	0	43	18.8	0.3
2.	Dimethenamid	PES	1.25	20	0	44	20.0	0
3.	Metolachlor	PPI	2.00	22	1	41	21.1	2.0
4.	Metolachlor	PES	2.00	23	0	45	21.1	1.3
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	20	1	48	22.1	0
6.	EPTC	PPI	3.50	21	0	42	16.0	1.0
7.	Lactofen	PES	0.125	22	2	53	20.0	0
8.	Lactofen	PES	0.188	23	1	44	20.3	0.7
9.	Metolachlor Lactofen	PES PES	2.00 0.13	20	3	45	18.5	4.5
10.	Metolachlor Lactofen	PES PES	1.00 0.188	20	2	35	19.0	0.0
11.	EPTC Lactofen (grower tr.)	PPI PES	2.8 0.188	na	3	44	14.8	2.3
12	EPTC Lactofen	PPI PES	3.5 0.188	22	1	53	18.0	0
13.	Clomazone (ME)	PES	0.50	20	0	44	20.3	6.6
14.	Bentazon	EPOST	1.00	22	-	44	20.7	1.9
15.	Two cultivations, no herbicide	-	-	21	0	46	20.8	7.4
16.	Check:uncultivated, no herbicide	-	-	22	0	45	16.9	11.3
	FPLSD (0.05)			ns	1.6	ns	1.5	4.8

[1] This rating reflects plant deformation (herbicide symptoms) rather than biomass reduction. In the lactofen treatments, the first true leaves had a spinach-like appearance. A rating of 10 = all seedlings showing injury, 0= none.
[2] Rating based on growth stage of weeds (rating of 3 = 1 seed producing plant/ 6.6 ft of row).

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96	7-1-96
Application timing	PPI	PES	POST
Start/end time	1:00 - 2:00	6:00 - 8:30	7:00 - 8:00
Air temp/soil temp (2")/surface	86/88/94		69/68/72
Rel humidity	50%	60%	60%
Wind direction/velocity	NW (1-5)	0	0
Cloud cover	0	70	0
Soil moisture	Dry	Dry	Dry
Plant moisture	-	-	Dew
Sprayer/PSI	Uni /40	Uni/40	40
Mix size	2000/ 3 plots	2000/ 3 plots	1400/ 3 plots
Gallons $H_2$0/acre	20	20	25
Nozzle type	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18
Soil inc depth (PPI/PRE)	2"		
Soil inc method/implement	Rotara & roller	0.5 " irrigation	

Table 4. Herbicide application data sheet, Lebanon, OR 1996

Application date	5-30-96	5-31-96	6-1-96	6-21-96
Application timing	PPI	PES	PES 2 (Trs 11 and 12)	POST
Start/end time	10:50-11:30	10:00 11:00	10:30 - 10:45	1st tri expanded 7:30-8:00
Air temp/soil temp (2")/surface	62.3/58.2	70.5/66.5	72/70/82	58/65/64
Rel humidity	40%	62%	70%	70%
Wind direction/velocity	NW 3.25 mph	2 SW	0-2 S	0
Cloud cover	50%	50%	0	100
Soil moisture	Dry Surface	Dry	Dry	Dry
Plant moisture	-	-	-	Dew (light)
Sprayer/PSI	Uni/40	Uni 40	Uni 40	40
Mix size	2 liters/3 plots	2 liters/3 plots	2 liters/3 plots	2/liter/3 plots
Gallons $H_2$0/acre	30	30	30	30
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	19/18	19/18	19/18	19/17
Soil inc depth (PPI/PRE)	2"	-	-	
Soil inc method/implement	rototiller	irrigation 0.5 " approx.	-	

Snap Bean Response to Rates of Metolachlor and Lactofen

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Objective

This trial was initially conceived to determine most cost effective use of metolachlor and lactofen for broadleaf and grass weed control in snap beans. However, broadleaf weed emergence was very low in the entire field. While weed control was difficult to evaluate, the extended period of rain after planting gave an opportunity to evaluate snap bean tolerance to combinations of these two herbicides.

Methods

Snap beans (OR 91G) were planted on May 11, 1996 on 15 inch rows on a silt loam soil with pH 5.6 , 6.2 % OM and CEC of 24.6 meq/100 g of soil. Herbicides were applied on May 13 to wet soil in 10 by 25 foot plots with 3 replications. A rainy period followed application with approximately 4 inches of rain in the first four weeks after planting. Emerged weeds were counted 4 WAP from 1 m^2 area in each plot. Emergence and the number of snap bean seedlings that had one fully expanded trifoliate were counted from six linear ft of row per plot. Snap bean biomass was harvested from a one m sq area in each plot. The grower applied quizalafop to the entire field, including the trial area to control annual ryegrass. Damage due to quizalafop was moderate shortly after application, and may have slightly depressed snap bean yield.

Results and Discussion

Treatments in the tables are arranged from low to highest rates of lactofen within increasing metolachlor rates. Crop injury and emergence at 4 WAP were highly variable within treatments (Table 1). Trends in crop injury were evident with the highest rate of metolachlor and lactofen. Injury increased within each set of metolachlor rates as the lactofen rate increased. Counting plants that had reached full expansion of the first trifoliate 4 WAP indicated lactofen also was slowing development. Snap bean biomass decreased steadily from 4.0 to 2.7 kgs/m^2 as the metolachlor and lactofen rates increased (Table 3).

Broadleaf weed emergence was very low (Table 2). Chickweed was the primary weed and was controlled by only the high rate of metolachlor and lactofen. Treatments 4 and 6 were the only treatments that improved total broadleaf weed compared to the untreated check.

Considering the weeds present, weed density at this site, and the inclement weather conditions during the initial four weeks of growth, the best overall treatment was metolachlor plus lactofen at 1.0 and 0.125 lbs ai/ac respectively. Though weed control was not exceptional with this treatment, it minimized both crop injury and crop yield loss due to weed competition. The data also indicate that metolachlor plus lactofen at 1.5 and 0.125 lbs ai/ac respectively could be used if more complete weed control were desired, but with a slight risk of yield loss.

Table 1. Snap bean and weed response to combinations of metolachlor and lactofen on June 10, 4 WAP, Albany OR, 1996

Herbicide	Rate		Crop injury	Emergence	Trifoliate stage	Annual ryegrass control
	pts or oz/ac	lbs ai/ac	%	no./3 ft	no/3 ft	%
1. Metolachlor	1 pt	1.00	7	15	12	40
Lactofen	8 oz	0.125				
2. Metolachlor	1 pt	1.00	10	12	10	33
Lactofen	12 oz	0.188				
3. Metolachlor	1.5 pt	1.50	0	14	12	37
Lactofen	4 oz	0.063				
4. Metolachlor II	1.5 pts	1.50	7	13	10	57
Lactofen	8 oz	0.125				
5. Metolachlor	2 pt	2.00	7	15	12	57
Lactofen	4 oz	0.063				
6. Metolachlor	2 pts	2.00	17	11	8	52
Lactofen	12 oz	0.188				
FPLSD (0.10)			ns	ns	3	28

Table 2. Weed survival on June 27, 6 WAP in snap beans, Albany, OR 1996.

	Herbicide	Rate		Groundsel	Chickweed	Knotweed	Misc.	Total
		pts. or oz/ac	lb ai/A	---------------------- no. /m sq				-------------------------
1.	Metolachlor	1 pt	1.000	0.0	3.3	0.0	0.0	3.3
	Lactofen	8 oz	0.125					
2.	Metolachlor	1 pt	1.00	0.0	5.0	0.0	1.0	6.0
	Lactofen	12 oz	0.188					
3.	Metolachlor	1.5 pt	1.500	0.0	2.3	0.0	1.3	3.7
	Lactofen	4 oz	0.063					
4.	Metolachlor	1.5 pts	1.500	0.0	1.3	0.0	0.0	1.3
	Lactofen	8 oz	0.125					
5.	Metolachlor	2 pt	2.000	0.3	1.7	0.7	1.0	3.7
	Lactofen	4 oz	0.063					
6.	Metolachlor	2 pts	2.000	0.0	0.3	0.0	0.3	0.7
	Lactofen	12 oz	0.188					
7.	Metolachlor	1.5 pts	1.500	0.0	2.0	0.0	0.5	2.5
	Lactofen (growers' tr.)	8 oz	0.125					
8.	Check			0.5	3.5	0.0	0.8	4.8
	FPLSD (0.05)			ns	2.9	ns	ns	2.8

Table 3. Snap bean biomass yield and weed control at harvest (July 22), Albany OR, 1996.

Herbicide	Rate		Biomass harvested	No. plants harvested	Avg. plant wt	Weed control estimate
	pts or oz	lbs ai/ac	kg/m sq	no/3 ft	gr.	%
1. Metolachlor	1 pt	1.00	4.0	38	109	70
Lactofen	8 oz	0.125				
2. Metolachlor	1 pt	1.00	3.8	36	111	73
Lactofen	12 oz	0.188				
3. Metolachlor	1.5 pt	1.500	3.8	33	122	70
Lactofen	4 oz	0.063				
4. Metolachlor	1.5 pts	1.500	3.6	32	112	90
Lactofen	8 oz	0.125				
5. Metolachlor	2 pt	2.000	2.9	35	84	90
Lactofen	4 oz	0.063				
6. Metolachlor	2 pts	2.000	2.7	29	91	77
Lactofen	12 oz	0.188				
7. Metolachlor II	1.5 pts	1.500	3.6	30	94	90
Lactofen (growers treatment)	8 oz	0.125				
8. Check			3.4	37	119	0
FPLSD (0.10)			0.9	ns	ns	16

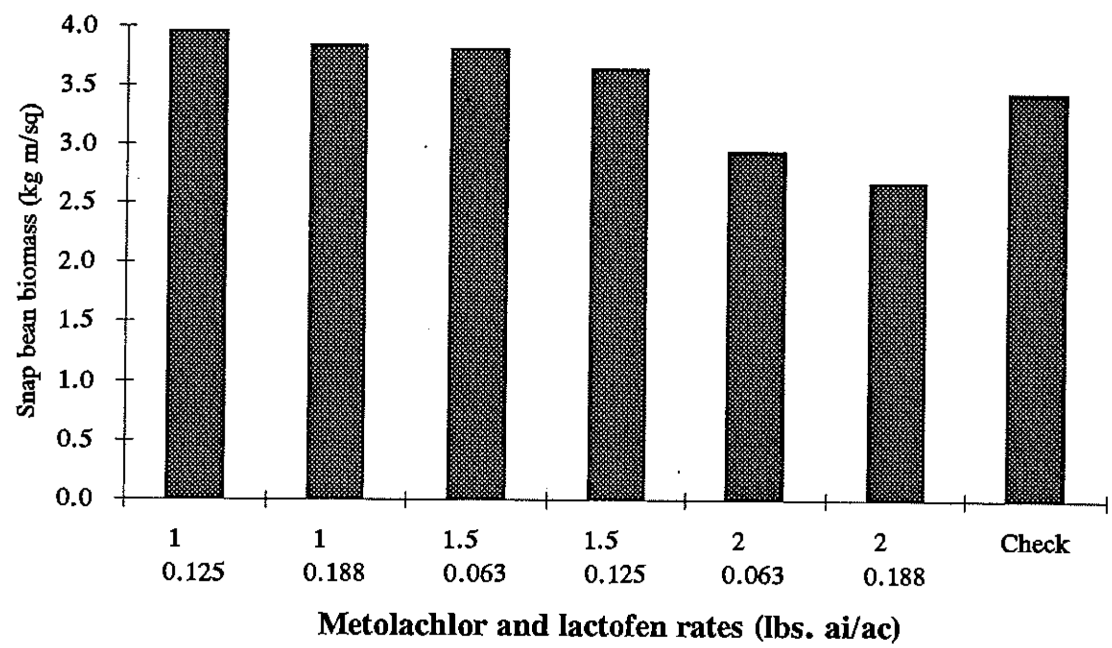

Figure 1. Snap bean tolerance to metolachor and lactofen.

Table 4. Herbicide application conditions.

Application date	May 13, 1996, 2 days after planting
Application timing	PES
Time of application	9:30-10:00
Air temp/ soil temp 2"(F)	62/62
Rel humidity (%)	92
Wind velocity (mph)	SW 0-3
Cloud cover	100 %
Soil moisture	very wet
Nozzle spacing and height	20/18"
Sprayer/ psi	unicycle/40 psi
Nozzle type	8003
Gals/A water	31
Incorporation	Excessive rain followed for next two weeks

Preplant and Preemergence Weed Control in Snap Beans

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Objectives

Evaluate metolachlor, dimethenamid, lactofen, sulfentrazone, FOE 5043, and clomazone for early season weed control in snap beans and tolerance of snap beans to these herbicides.

Methods

Snap beans were planted at the Vegetable Research Farm near Corvallis on a silty clay loam soil on June 7 in 7.5 by 30 ft plots, with three replications. PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application, and snap beans (var. OR 91G) were planted on 30 inch rows. PES herbicides were incorporated with 0.5 inches of irrigation 3 days after planting. Fonofos was applied and incorporated with the last tillage as a soil insecticide, before the PPI herbicides were applied. A single between-row cultivation was used to reduce weed competition. Hand hoeing and pulling were not used because of potential negative impact on crop growth.

Snap bean seedlings were counted 2 WAP from 3 linear ft of row. Emerged weeds were counted at 4 WAP from 11 ft^2 in each plot by species. Crop injury was evaluated as percent biomass reduction at 4 WAP.

Results and Discussion

Nightshades (Table 1). Dimethenamid was much more effective at controlling hairy nightshade (HNS) than metolachlor. The data is not conclusive for black nightshade (BNS) but indicates that EPTC does not control BNS as well as HNS. Metolachlor and dimethenamid may have controlled BNS better than HNS. Nightshade control with sulfentrazone was exceptional. Nightshades were completely tolerant to FOE 5043.

Combinations of EPTC with lactofen, or metolachlor and dimethenamid completely controlled nightshade at 4 WAP.

Pigweed. Most treatments controlled pigweed, including FOE 5043. Poor control was recorded with clomazone.

Other. Smartweed is difficult to control with currently registered PPI/PES herbicides in snap beans. Although the variability in this plot was high and statistically there was no difference among treatments at $\alpha=0.05$, it is apparent that metolachlor had little effect on smartweed emergence. Dimethenamid alone reduced smartweed emergence more than metolachlor.

Snap bean tolerance (Table 2, see report *Snap Bean Tolerance to Herbicides* for more complete yield information). Dimethenamid applied PPI significantly injured snap beans at both the 1.2 and 2.5 lb ai/ac rates. Dimethenamid PES did not injure snap beans more than metolachlor PES at either rate.

From this and the previous two years of research, it is apparent that snap beans are less tolerant to dimethenamid than metolachlor when used at the rates listed in this trial. These rates reflect similar costs per acre for metolachlor and dimethenamid. Reducing the rate of dimethenamid might afford the same weed control and risk of injury to snap beans as metolachlor, with a slightly lower cost. However, the risk of injury with PPI applications may outweigh the benefits. PES applications potentially limit dimethenamid contact with the snap bean roots, but may not provide the crop safety needed if cool and very wet springs are encountered.

Snap beans were moderately tolerant of sulfentrazone. Sulfentrazone was tested primarily because of concerns that carryover from previous crops such as squash could affect snap bean growth. Given the tolerance levels demonstrated here, it is unlikely sulfentrazone applied the previous year would affect snap beans. As sulfentrazone was not tested PPI in this trial, it is not clear the impact that soil tillage and mixing might have on the tolerance of beans to sulfentrazone.

Snap beans were also tolerant to FOE 5043, but nightshade control was very poor. FOE 5043 in combination with lactofen could be a very good weed control program.

Table 1 . Weed emergence at 4 WAP, Corvallis, OR 1996.

	Herbicide	Timing	Rate	Hairy night-shade	Black night-shade	Pigweed	Purslane	Smart-weed	Barnyard -grass	Witch-weed	Total
				no/m sq							
1.	Dimethenamid	PPI	1.25	1	0	0	0	0	0	0	1
2.	Dimethenamid	PES	1.25	0	0	0	1	0	0	0	1
3.	Dimethenamid Dimethenamid	PPI PES	0.75 0.50	1	0	0	0	1	0	0	4
4.	Metolachlor	PPI	2.00	13	4	1	6	8	0	0	32
5.	Metolachlor	PES	2.00	14	0	1	2	7	0	0	23
6.	Metolachlor Metolachlor	PPI PES	1.25 0.83	12	0	0	0	0	0	0	13
7.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0	0	0	0	3	0	0	3
8.	EPTC	PPI	3.50	8	7	1	3	4	0	0	23
9.	Lactofen	PES	0.13	3	4	0	0	2	6	13	28
10.	Lactofen	PES	0.19	0	0	0	0	2	7	12	21
11.	Metolachlor Lactofen	PES PES	2.00 0.13	0	0	0	0	9	0	0	9
12.	Metolachlor Lactofen	PES PES	1.00 0.19	0	0	0	0	0	0	0	0
13.	Dimethenamid Lactofen	PES PES	1.20 0.13	0	0	0	0	1	0	0	1
14.	Dimethenamid Lactofen	PES PES	0.75 0.19	0	0	0	0	0	0	0	0
15.	EPTC Lactofen	PPI PES	3.50 0.19	0	0	0	0	2	0	0	2
16.	Clomazone[1]	PES	0.50	0	2	4	0	4	0	0	11
17.	Sulfentrazone	PES	0.094	1	0	0	0	7	0	0	8
18.	Sulfentrazone	PES	0.188	1	0	0	0	4	3	7	19
19.	FOE 5043	PES	0.45	75	3	1	14	2	0	0	95
20.	FOE 5043	PES	0.9	83	5	0	0	0	0	0	128
21.	Check			74	21	36	30	4	22	13	170
	FPLSD (0.05)			36	ns	15	17	ns	ns	13	49

[1] ME (microencapsulated) formulation applied.

Table 2. Crop injury and snap bean seedling emergence at 3 WAP, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Injury rating	Emergence
			% growth reduction	No./3 ft of row
1. Dimethenamid	PPI	1.25	13	21
1a. Dimethenamid	PPI	2.50	10	20
2. Dimethenamid	PES	1.25	5	24
2a. Dimethenamid	PES	2.50	2	22
3. Dimethenamid Dimethenamid	PPI PES	0.75 0.50	0	23
4. Metolachlor	PPI	2.00	3	21
4a. Metolachlor	PPI	4.00	3	24
5. Metolachlor	PES	2.00	0	25
5a. Metolachlor	PES	4.00	0	23
6. Metolachlor Metolachlor	PPI PES	1.25 0.83	0	23
7. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	5	23
8. EPTC	PPI	3.50	0	26
9. Lactofen	PES	0.13	3	25
10. Lactofen	PES	0.19	2	20
11. Metolachlor Lactofen	PES PES	2.00 0.13	0	22
12. Metolachlor Lactofen	PES PES	1.00 0.19	7	25
13. Dimethenamid Lactofen	PES PES	1.20 0.13	0	24
14. Dimethenamid Lactofen	PES PES	0.75 0.19	2	25
15. EPTC Lactofen	PPI PES	3.50 0.19	2	26
16. Clomazone	PES	0.50	2	26
17. Sulfentrazone	PES	0.094	7	21
18. Sulfentrazone	PES	0.188	23	20
19. FOE 5043	PES	0.45	0	26
20. FOE 5043	PES	0.9	0	23
21. No herbicide	-	-	0	22
FPLSD(0.05)			7	NS

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96
Application timing	PPI	PES
Start/end time	1:00 - 2:00	6:00 - 8:30
Air temp/soil temp (2")/surface	86/88/94	NA
Rel humidity	50%	60%
Wind direction/velocity	NW, 1-5	0
Cloud cover	0	70
Soil moisture	Dry	Dry
Plant moisture	-	-
Sprayer/PSI	Uni /40	Uni/40
Mix size	2000 ml/3 plots	2000 ml/3 plots
Gallons H_20/acre	20	20
Nozzle type	8003	8003
Nozzle spacing and height	20/18	20/18
Soil inc depth (PPI/PRE)	2”	2”
Soil inc method/implement	Lely rotara & roller	0.5” irrigation (6/10/96)

Herbicide Impacts on Weed Growth and Survival in Snap Beans

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Objectives

1. Quantify impact of herbicides on weed survival and growth in snap beans within and between rows.
2. Develop an efficient evaluation system to estimate weed survival.

Methods

This research was conducted at a farm near Lebanon, OR and at the Vegetable Research Farm of OSU near Corvallis. Snap beans were planted at the Lebanon site on May 30, 1996 and at Corvallis on June 7 in 12.5 by 30 ft plots with three replications.

At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows, and PES herbicides were incorporated with 0.5 inches irrigation three days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and the field rolled before PES application. The grower applied treatment is Tr. 11 in Tables 5-7. Ethoprop and EPTC (PPI) were incorporated, snap beans planted on 24 inch rows (May 30), and lactofen applied, after which the field was rolled. The field was irrigated approximately one week later, just as the beans were emerging.

The weed emergence potential (as defined by the untreated check) at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis, weed emergence potential was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

At harvest, snap bean plants were pulled from 6.6 ft of row. Weeds in the cleared area were evaluated in: 1) a 10 inch band immediately over the row; and 2) the area between the rows according to the following size classes:

1. weeds ≥ 4 leaves, stem dia < 5.6 mm (sieve size 2).
2. weeds with stem dia. ≥ 5.6 mm
3. weeds with seeds or berries ≥ 5.6 mm
4. in the case of nightshade mature berries.

To analyze the data, each weed class size was multiplied by the number of each species surviving in each zone, whether between or in rows. The total value calculated for each species was then adjusted to compensate for the difference between the area in the row and the area between rows. A value of 0 would indicate no weeds present.

The advantage of this evaluation system is that it is quick, provides quantitative measurements rather than qualitative, is designed to reflect risk both this year and in future crops, and does not get bogged down in the voluminous and highly variable biomass and density measurements. Additionally, the values assigned to each size class can be adjusted to reflect immediate to long-term production concerns.

Results and discussion

The data for the Corvallis site is presented in Tables 1-4 and for the Lebanon site in Tables 5-7. The difference between in-row and between-row measurements indicates to some degree the compatibility of a particular herbicide with other strategies such as cultivation, which may or may not compliment the herbicide. For instance, PPI metolachlor was very poor at reducing nightshade growth in-rows, whereas metolachlor applied PES was more effective in-row but was not efficient between rows. This would indicate that a timely cultivation might be effective with PES metolachlor but would be very ineffective with PPI metolachlor. Low values within rows compared to high values between rows indicate treatments that would be complimented by cultivation.

Table 1. Nightshade survival and growth in response to herbicides, Corvallis, OR 1996.

Herbicide	Timing	Rate	Nightshade control rating			
			In-row	Middles	Difference (mid less in-row)	Total
1. Dimethenamid	PPI	1.25	0	2	2	2
2. Dimethenamid	PES	1.25	2	1	-2	3
3. Metolachlor	PPI	2.00	5	3	-2	9
4. Metolachlor	PES	2.00	2	6	-5	8
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0	0	0	0
6. EPTC	PPI	3.50	6	1	5	7
7. Lactofen	PES	0.13	0	0	0	0
8. Lactofen	PES	0.19	0	0	0	0
9. Metolachlor Lactofen	PES PES	2.00 0.13	0	0	0	0
10. Metolachlor Lactofen	PES PES	1.00 0.19	0	0	0	0
11. EPTC Lactofen	PPI PRE	3.50 0.19	0	0	0	0
12. EPTC	EPOST		4	0	-4	4
13. Clomazone	PES	0.50	0	0	0	0
14. One cultivation (no herbicide)	-		19	0	-19	19
15. Check (no herbicide)	-		15	19	4	34
FPLSD (0.10)			5	3	5	9

Table 2. Pigweed survival and growth in response to herbicides, Corvallis, OR 1996.

Herbicide	Timing	Rate	Pigweed control rating			
			In-row	Middles	Difference (mid less in-row)	Total
		lbs/A				
1. Dimethenamid	PPI	1.25	0	0	0	0
2. Dimethenamid	PES	1.25	0	0	0	0
3. Metolachlor	PPI	2.00	2	2	0	4
4. Metolachlor	PES	2.00	1	0	-1	1
5. Metolachlor	PPI	2.00	0	0	0	0
EPTC	PPI	3.50				
Trifluralin	PPI	0.50				
6. EPTC	PPI	3.50	4	2	-2	6
7. Lactofen	PES	0.13	0	0	0	0
8. Lactofen	PES	0.19	0	0	0	0
9. Metolachlor	PES	2.00	0	0	0	0
Lactofen	PES	0.13				
10. Metolachlor	PES	1.00	0	0	0	0
Lactofen	PES	0.19				
11. EPTC	PPI	3.50	0	0	0	0
Lactofen	PRE	0.19				
12. Bentazon	EPOST		12	10	22	22
13. Clomazone	PES	0.50	2	4	2	6
14. One cultivation	-		5	1	-4	6
15. Check no herbicide	-		10	21	11	31
FPLSD (0.10)			6	6	NS	9

Table 3. Comparison of weed growth ratings for between and inrow weed. Corvallis, OR, 1996.

Herbicide	Timing	Rate	Smartweed rating			
			Inrow	Middles	Difference	Total
1. Dimethenamid	PPI	1.25	4	0	-4	4
2. Dimethenamid	PES	1.25	0	0	0	0
3. Metolachlor	PPI	2.00	3	2	-2	5
4. Metolachlor	PES	2.00	0	1	1	1
5. Metolachlor	PPI	2.00	1	0.3	-1	1
EPTC	PPI	3.50				
Trifluralin	PPI	0.50				
6. EPTC	PPI	3.50	4	2	-3	6
7. Lactofen	PES	0.13	0	2	2	2
8. Lactofen	PES	0.19	5	4	-1	9
9. Metolachlor	PES	2.00	4	5	1	9
Lactofen	PES	0.13				
10. Metolachlor	PES	1.00	0	0.5	1	1
Lactofen	PES	0.19				
11. EPTC	PPI	3.50	1	1	0	2
Lactofen	PRE	0.19				
12. Bentazon	EPOST		4	0	-4	4
13. Clomazone	PES	0.50	5	15	10	20
14. One cultivation	-		5	0	-5	5
15. No herbicide	-		0	0.5	1	1
FPLSD (0.10)			ns	3.3	ns	9.00

Table 4. Herbicide effects on total weed control at snap bean harvest, Corvallis, OR 1996.

Herbicide	Timing	Rate	Cumulative rating for all weeds present			
			Inrow	Middles	Difference (middles less in-row)	Total
1. Dimethenamid	PPI	1.25	4	2	-2	6
2. Dimethenamid	PES	1.25	2	1	-2	3
3. Metolachlor	PPI	2.00	10	7	-3	17
4. Metolachlor	PES	2.00	3	8	5	11
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	1	0	-1	1
6. EPTC	PPI	3.50	14	4	-10	18
7. Lactofen	PES	0.13	3	8	5	11
8. Lactofen	PES	0.19	6	5	-1	11
9. Metolachlor Lactofen	PES PES	2.00 0.13	4	5	1	9
10. Metolachlor Lactofen	PES PES	1.00 0.19	0	1	1	1
11. EPTC Lactofen	PPI PRE	3.50 0.19	1	1	0	2
12. Bentazon	EPOST		26	15	-11	41
13. Clomazone	PES	0.50	8	20	12	28
14. One cultivation	-		30	1	-29	31
15. No herbicide	-		32	52	20	84
FPLSD (0.10)			9	9	9	16

Table 5. Nightshade response to herbicide and location in the field, Lebanon, OR, 1996.

	Herbicide	Timing	Rate	Nightshade control rating			
				Inrows	Middles	Difference	Total
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.3	0.9	0.6	1.3
2.	Dimethenamid	PES	1.25	0.0	0.5	0.5	0.5
3.	Metolachlor	PPI	2.00	2.0	0.7	-1.3	2.7
4.	Metolachlor	PES	2.00	1.3	5.2	3.9	6.5
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0.0	0.0	0.0	0.0
6.	EPTC	PPI	3.50	1.0	0.2	-0.8	1.2
7.	Lactofen	PES	0.125	0.0	0.0	0.0	0.0
8.	Lactofen	PES	0.1875	0.7	0.0	-0.7	0.7
9.	Metolachlor Lactofen	PES PES	2.00 0.13	0.0	0.0	0.0	0.0
10.	Metolachlor Lactofen	PES PES	1.00 0.19	0.0	0.0	0.0	0.0
11.	EPTC[1] Lactofen	PPI PES	2.8 0.188	0.7	1.7	1.0	2.3
12.	Clomazone	PES	0.50	1.3	4.0	2.7	5.4
13.	Bentazon	EPOST	1.00	0.0	0.4	0.4	0.4
14.	One cultivation			5.0	0.7	-4.3	5.7
15.	Check, no herbicide			2.0	3.8	1.8	5.8
	FPLSD(0.10)			1.6	2.7	ns	3

[1] Grower applied treatment.

Table 6. Lambsquarter response to herbicides and location in field, Lebanon, OR, 1996.

	Herbicide	Timing	Rate	Lambsquarter control rating			
				Inrows	Middles	Difference	Total
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.0	0.0	0.0	0.0
2.	Dimethenamid	PES	1.25	0.0	0.0	0.0	0.0
3.	Metolachlor	PPI	2.00	0.0	0.0	0.0	0.0
4.	Metolachlor	PES	2.00	1.0	1.4	0.4	2.4
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0.0	0.0	0.0	0.0
6.	EPTC	PPI	3.50	0.0	0.0	0.0	0.0
7.	Lactofen	PES	0.125	1.0	2.6	1.6	3.6
8.	Lactofen	PES	0.1875	0.0	0.0	0.0	0.0
9.	Metolachlor Lactofen	PES PES	2.00 0.13	2.3	2.1	-0.2	4.5
10.	Metolachlor Lactofen	PES PES	1.00 0.19	0.0	0.0	0.0	0.0
11.	EPTC[1] Lactofen	PPI PES	2.8 0.188	0.0	0.0	0.0	0.0
12.	Clomazone	PES	0.50	0.0	0.2	0.2	0.2
13.	Bentazon	EPOST	1.00	1.0	0.0	-1.5	1.5
14.	One cultivation			0.0	0.0	0.0	0.0
15.	Check: no herbicide			1.7	1.4	-0.2	3.1
	FPLSD(0.10)			1.2	2	ns	2.2

[1] Grower applied treatment.

Table 7. Summary table for Lebanon site, 1996.

	Herbicide	Timing	Rate	Total weed control rating by location in plot			Total weed rating
				Inrow	Middles	Difference	
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.3	0.9	0.6	1.3
2.	Dimethenamid	PES	1.25	4.0	0.5	-3.5	4.5
3.	Metolachlor	PPI	2.00	2.0	0.7	-1.3	2.7
4.	Metolachlor	PES	2.00	2.3	7.6	5.2	9.9
5.	Metolachlor	PPI	2.00	0.0	0.0	0.0	0.0
	EPTC	PPI	3.50				
	Trifluralin	PPI	0.50				
6.	EPTC	PPI	3.50	1.0	0.2	-0.8	1.2
7.	Lactofen	PES	0.125	1.0	2.6	1.6	3.6
8.	Lactofen	PES	0.1875	0.7	0.0	-0.7	0.7
9.	Metolachlor	PES	2.00	2.3	2.1	-0.2	4.5
	Lactofen	PES	0.13				
10.	Metolachlor	PES	1.00	0.0	0.0	0.0	0.0
	Lactofen	PES	0.19				
11.	EPTC[1]	PPI	2.8	0.7	1.7	1.0	2.3
	Lactofen	PES	0.188				
12.	Clomazone	PES	0.50	2.3	4.3	1.9	6.6
13.	Bentazon	EPOST	1.00	1.5	0.4	-1.1	1.9
14.	One cultivation			6.7	0.7	-6.0	7.4
15.	Check			5.3	5.9	0.6	11.3
	FPLSD(0.10)			2.8	4.2	ns	4.8

[1] Grower applied treatment.

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96	7-1-96
Application timing	PPI	PES	POST
Start/end time	1:00 - 2:00	6:00 - 8:30	7:00 - 8:00
Air temp/soil temp (2")/surface	86/88/94		69/68/72
Rel humidity	50%	60%	60%
Wind direction/velocity	NW (1-5)	0	0
Cloud cover	0	70	0
Soil moisture	Dry	Dry	Dry
Plant moisture	-	-	Dew
Sprayer/PSI	Uni /40	Uni/40	40
Mix size	2000/ 3 plots	2000/ 3 plots	1400/ 3 plots
Gallons $H_2$0/acre	20	20	25
Nozzle type	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18
Soil inc depth (PPI/PRE)	2"		
Soil inc method/implement	Rotara & roller	0.5 " irrigation	

Table 4. Herbicide application data sheet, Lebanon, OR 1996

Application date	5-30-96	5-31-96	6-1-96	6-21-96
Application timing	PPI	PES	PES 2 (Trs 11 and 12)	POST
Start/end time	10:50-11:30	10:00 11:00	10:30 - 10:45	1st tri expanded 7:30-8:00
Air temp/soil temp (2")/surface	62.3/58.2	70.5/66.5	72/70/82	58/65/64
Rel humidity	40%	62%	70%	70%
Wind direction/velocity	NW 3.25 mph	2 SW	0-2 S	0
Cloud cover	50%	50%	0	100
Soil moisture	Dry Surface	Dry	Dry	Dry
Plant moisture	-	-	-	Dew (light)
Sprayer/PSI	Uni/40	Uni 40	Uni 40	40
Mix size	2 liters/3 plots	2 liters/3 plots	2 liters/3 plots	2/liter/3 plots
Gallons $H_2$0/acre	30	30	30	30
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	19/18	19/18	19/18	19/17
Soil inc depth (PPI/PRE)	2"	-	-	
Soil inc method/implement	rototiller	irrigation 0.5 " approx.	-	

Impact of Herbicides and Cultivation on Snap Bean Yield

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Objectives

Determine impact of cultivation on yield of snap beans across herbicide treatments.

Methods

This research was conducted at a farm near Lebanon, OR and at the Vegetable Research Farm of OSU near Corvallis. Snap beans were planted at the Lebanon site on May 30, 1996 and at Corvallis on June 7 in 12.5 by 30 ft plots with three replications.

At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows and PES herbicides were incorporated with 0.5 inches irrigation three days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and the field rolled before PES application. The grower applied treatment is Tr. 11 in Table 3. Ethoprop and EPTC (PPI) were incorporated, snap beans planted on 24 inch rows (May 30), and lactofen applied, after which the field was rolled. The field was irrigated approximately one week later, just as the beans were emerging.

The weed emergence potential (as defined by the untreated check) at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis, weed emergence potential was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

Each plot at both sites was split into two parts. One half was cultivated at 4 WAP and the other half was left untouched. At Lebanon, cultivation was done with a hand push cultivator that removed all weeds except those within a 10 inch band over the row. At Corvallis, cultivation was done with a small tractor with sweeps set to remove all weeds except those within a 10 inch band in the row.

At harvest, snap bean plants were pulled from 6.6 ft of row, and total plant biomass weighed. Weed control estimates are presented from the Corvallis site because of the high density of weeds at this site and the close relationship with the number of weeds and yield in several of the treatments. At Lebanon, the weed population was much lower and effects on yield are more difficult to distinguish.

Results and discussion

Corvallis. Cultivation increased the yield of all but one treatment, and caused the largest biomass increase in the metolachlor PES, EPTC, lactofen (0.125), and bentazon treatments. Cultivation caused only a moderate increase in biomass for metolachlor (PPI) and lactofen (0.19) treatments. Most of the increases due to cultivation can be explained by improved weed control

(Table 2). However, the substantial decrease in the EPTC + lactofen treatment is unexplained. All weeds were controlled in this treatment except smartweed, and a single cultivation nearly eliminated smartweed from these plots. Metolachlor (PPI) did not give adequate control, and removing weeds in the row middles did little to improve yield.

Lebanon. The impact of cultivation was much less at the Lebanon site because weed density overall was lower. Even well-timed bentazon plus one cultivation yielded very well. The yield of the grower applied treatment of EPTC plus lactofen was very low and cultivation was no advantage. The greatest improvements in yield were in lactofen treatments that did not control lambsquarter (data not presented).

Table 1. Impact of cultivation on snap bean biomass production at harvest, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Snap bean biomass yield		
			un-cultivated	cultivated	% inc
				---- t/ac----	
1. Dimethenamid	PPI	1.25	18.5	21.0	14
2. Dimethenamid	PES	1.25	19.3	20.2	5
3. Metolachlor	PPI	2.00	15.3	16.6	9
4. Metolachlor	PES	2.00	16.1	19.7	22
5. Metolachlor	PPI	2.00	19.8	21.9	11
EPTC	PPI	3.5			
Trifluralin	PPI	0.5			
6. EPTC	PPI	3.50	13.2	19.8	50
7. Lactofen	PES	0.13	13.3	19.1	44
8. Lactofen	PES	0.19	15.3	16.6	8
9. Metolachlor	PES	2.0	18.1	20.8	15
Lactofen	PES	0.125			
10. Metolachlor	PES	1.0	19.3	19.7	2
Lactofen	PES	0.19			
11. EPTC	PPI	3.5	18.8	15.9	-15
Lactofen	PRE	0.125			
12. Bentazon	EPOST	2.00	9.3	16.1	73
13. Clomazone	PES	0.25	15.4	20.0	29
14. No herbicide			5.5	15.3	177
FPLSD (0.05)			6.1	6.1	

Table 2. Impact of cultivation on snap bean biomass production and weed control, Corvallis, OR, 1996. Weed control was estimated at snap bean harvest.

Herbicide	Timing	Rate	Pigweed			Hairy nightshade			Smartweed		
			un-cultivated	cultivated	% inc	un-cultivated	cultivated	% inc	un-cultivated	cultivated	% inc
1. Dimethenamid	PPI	1.25	97	100	3	100	100	0	83	100	17
2. Dimethenamid	PES	1.25	67	98	32	100	100	0	97	100	3
3. Metolachlor	PPI	2.00	70	85	15	67	80	13	10	37	27
4. Metolachlor	PES	2.00	89	95	6	48	100	53	48	75	28
5. Metolachlor	PPI	2.00	100	100	0	100	100	0	67	87	20
EPTC	PPI	3.50									
Trifluralin	PPI	0.50									
6. EPTC	PPI	3.50	70	83	13	87	100	13	33	73	40
7. Lactofen	PES	0.13	100	100	0	100	100	0	0	85	85
8. Lactofen	PES	0.19	100	100	0	100	100	0	10	97	87
9. Metolachlor	PES	2	100	100	0	100	100	0	60	87	27
Lactofen	PES	0.125									
10. Metolachlor	PES	1	100	100	0	100	100	0	67	97	30
Lactofen	PES	0.19									
11. Bentazon	EPOST	1.0	0	65	65	33	60	27	83	88	5
12. Clomazone	PES	0.25	63	95	32	100	100	0	10	73	63
13. EPTC	PPI	3.5	100	100	0	100	100	0	13	100	87
Lactofen	PRE	0.125									
14. No herbicide			0	47	47	0	43	45	0	45	45
FPLSD (0.05)			25			32			48		

Table 3. Impact of cultivation on snap bean biomass yield, Lebanon, OR, 1996

	Herbicide	Timing	Rate	Snap bean biomass yield		
				Uncultivated	Cultivated	Biomass increase
				t/ac	t/ac	%
1.	Dimethenamid	PPI	1.25	16.2	18.8	14
2.	Dimethenamid	PES	1.25	18.2	20.0	9
3.	Metolachlor	PPI	2.00	18.9	21.1	10
4.	Metolachlor	PES	2.00	21.2	21.1	-1
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	19.4	22.1	12
6.	EPTC	PPI	3.50	17.5	16.0	-10
7.	Lactofen	PES	0.125	15.7	20.0	21
8.	Lactofen	PES	0.1875	16.2	20.3	20
9.	Metolachlor Lactofen	PES PES	2.00 0.13	20.8	18.5	-12
10.	Metolachlor Lactofen	PES PES	1.00 0.19	17.8	19.0	6
11.	EPTC (grower applied) lactofen	PPI PES	2.8 0.125	12.9	14.8	12
12.	Bentazon	EPOST	1.00	15.9	20.7	23
13.	Clomazone (ME)	PES	0.50	17.8	19.0	6
14	No herbicide			13.7	16.9	19
	FPLSD(0.05)				2.6	

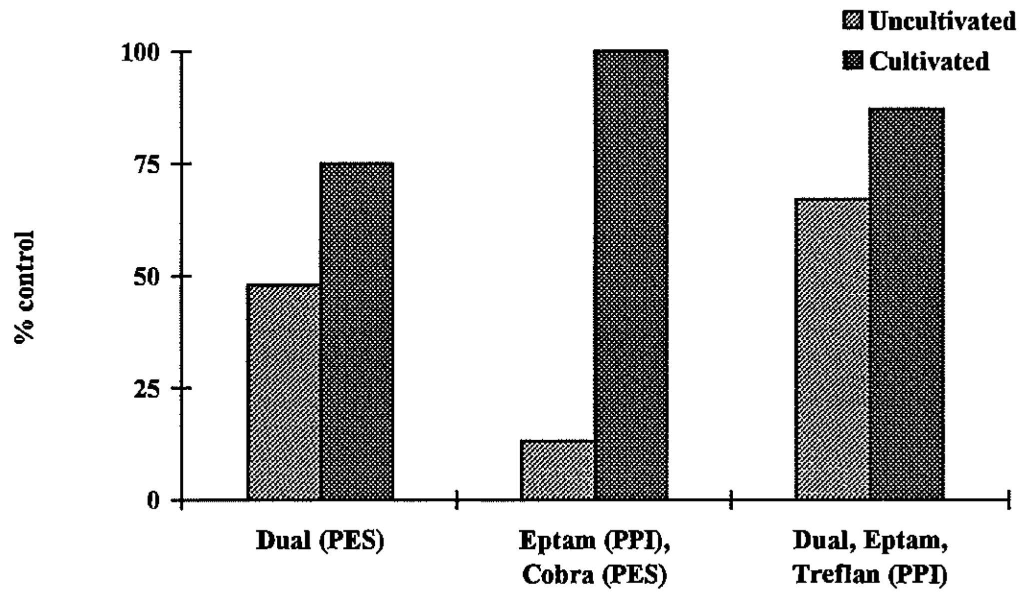

Figure 1. Smartweed control in snap beans at harvest, Corvallis, OR 1996.

Timing of Goal Application for Weed Control in Cauliflower

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Introduction and objectives

Growers have noted that weed control with Goal in transplanted cauliflower is erratic. When Goal is applied to a very dry soil surface in mid-day when soil temperature is very high, Goal efficacy is reduced. Rototilling just before application improves weed control but the effect is unpredictable. Goal is tightly adsorbed to soil particles and may be permanently adsorbed if soil moisture is very low. Perhaps this effect could explain these observations.

The objective of this research was to determine the effect of application timing on Goal weed control efficacy in cauliflower with three rates of herbicide and four levels of soil moisture..

Methods

Goal was applied pre-transplant surface to a silt loam soil near Mollala, OR, on July 24, 1996. Treatment variables were four application timings (afternoon or evening; before or after rototilling) and three herbicide rates (0.15/ 0.25, 0.5 lbs ai/acre) for a total of 12 treatments. The treatments that required rototilling just prior to herbicide application were applied in continuous strips across the entire plot (three blocks for replication). The experimental design was a complete factorial (4 timings by 3 herbicide rates) with three replicated blocks. The plot width was 15 feet but herbicides were applied to only 10 ft and the remaining 5 ft strip was used as a comparison for weed control estimates.

Emerged weeds were counted on September 6, six weeks after Goal application. Weed control was visually estimated again on Oct. 11, eleven weeks after treatment (WAT) by comparing weed density and growth to untreated check strips within the field. Data were analyzed as a factorial split-plot with main effects of soil management and herbicide rate.

Results and Discussion

Ideal conditions were available to test the hypothesis that soil moisture present at application determines efficacy of Goal herbicide. The soil had been last tilled one week prior to application and very hot and dry conditions caused very dry soil on the surface of plots. Soil moisture was good beneath the surface and rototilling brought moist soil to the 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. Afternoon soil surface temperatures were near 127 F in the untilled strip when the Goal herbicide was applied.

The most notable effect on weed control was caused by herbicide rate (Table 1-3). 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, did not conform to trends for lambsquarter and pigweed, and differences in treatment effects on nightshade were not statistically significant. Within the lower rates of Goal, however, emergence of pigweed at 6 WAT indicated that Goal application to recently tilled soil significantly reduced weed emergence. The trend was not consistent for lambsquarter and total weed emergence, however. Goal applied at 0.15 lbs ai/A in the afternoon to recently rototilled soil had the lowest total weed emergence overall 6 WAP.

A second visual estimation at 11 WAT again indicated that herbicide rate effects were much more important than application timing for all species evaluated. Nonetheless, pigweed and lambsquarter were controlled best by Goal applied in the evening whether rototilled on not before the application (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 was not consistent between species when applied in the afternoon or evening. Though the best practice can not be easily discerned from this data 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 dry soil at midday.

Table 1. Weed emergence in response to Goal herbicide application timing and rate 6 WAP, Mollala, OR 1996

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

Table 2. Weed emergence in response to low rates of Goal at four application timings, 6 WAP, Mollala, OR 1996

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

Table 3. Analysis of variance components for weed density at 6 WAP, Mollala, OR 1996

	Pigweed	Nightshade	Lambsquarter	Total
Timing and tillage	0.009	0.19	0.07	0.16
Herbicide rate	0.003	0.0013	0.0001	0.0001
Timing x herb rate	0.03	0.67	0.40	0.77

Table 4. Weed control at 11 weeks after planting in cauliflower, Mollala, OR, 1996

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

Table 5. Weed control estimate at 11 weeks after planting in cauliflower, Mollala, OR, 1996

	Timing and tillage	Goal rate	Pigweed	Nightshade	Lambsquarter	Overall control rating
		-lbs ai/ac-	------------------------- % -----------------------------			
1	Aft, untilled	0.15	50	47	3	30
4	Eve, untilled	0.15	80	25	43	33
7	Aft, tilled	0.15	63	50	20	43
10	Eve, tilled	0.15	90	77	50	60
	FPLSD (0.05)		32	30	36	26

Table 6. Analysis of variance components for weed control estimates at 11 WAP, Mollala, OR 1996

	Pigweed	Lambsquarter	Nightshade	Overall control rating
Timing and tillage	0.40	.019	.037	.052
Herbicide rate	0.002	0.0001	0.0001	0.0001
Timing x herb rate	0.60	0.19	0.43	0.54

Table 7. Herbicide application details.
Plot size: 10*30

Application date	July 24, 1996	
Application timing	Afternoon (Preplant surface over untilled soil or within 10 minutes of rototilling)	Evening (Preplant surface over untilled soil or within 10 minutes of rototilling)
Time of application	1:15-2:00 PM	9:30-10:00 PM
Soil surface temp (F)	127 (untilled) 95 (rototilled)	77 (untilled) 71 (rototilled)
Air temperature	95	77
Rel humidity (%)	60	48
Wind velocity (mph)	0-3 N	0-2 N
Cloud cover	0	0
Soil moisture	damp	damp
Nozzle height	6”	6”
Sprayer/ psi	unicycle/40 psi	unicycle/40 psi
Nozzle type	8003	8003
Gals/A water	25	25

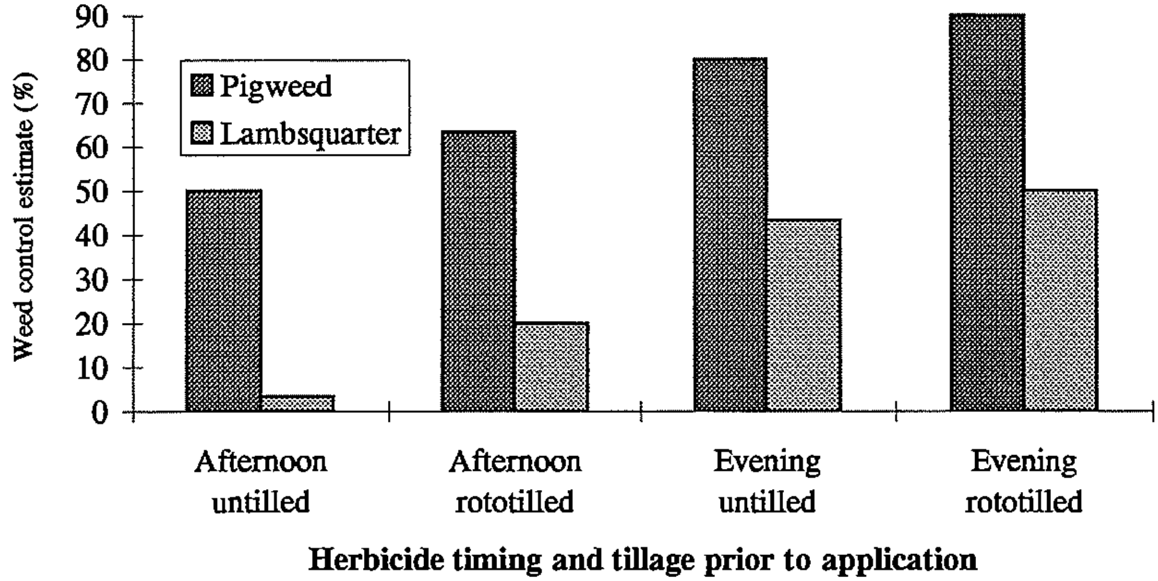

Figure 1. Effect of herbicide application timing and tillage prior to application on weed control in cauliflower, 11 weeks after application.

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

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Objectives

Determine potential of fertilizer impregnated with Goal and pyridate for postemergence weed control in broccoli.

Methods

Trifluralin was incorporated into the soil on the entire plot to suppress weeds until the fertilizer was applied. Broccoli and cauliflower were planted with a Gaspardo vacuum seeder on June 13 and July 22, respectively. 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 with a fertilizer spreader 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.

Results and discussion

Broccoli

Nightshade was the primary weed that emerged at this site because nightshade is extremely tolerant of trifluralin. Therefore, weed control was poor as nightshade also is moderately tolerant to Goal. Weed control diminished rapidly as the herbicide was applied later in the season. The fertilizer must be applied early enough so that it can distribute from the prills and establish a soil barrier before weeds break the surface. Crop injury from the Goal impregnated fertlizer was very low.

Pyridate was very effective for postemergence weed control but also severely injured the broccoli when applied when the broccoli had two true leaves. Pyridate is effective on many broadleaf weeds but timing with pyridate is very critical for proper weed control as demonstrated when applied to 6 leaf broccoli. A level of suppression greater than that afforded by trifluralin would be needed early in the season if pyridate is to be used for control for weeds such as nightshade.

Cauliflower

The initial treatment was applied just as the cauliflower was emerging. This application on cauliflower was moved up in an attempt to improve weed control. However, applying goal impregnated fertilizer at this stage significantly increased plant injury and reduced the number of surviving plants. Injury was much greater than in the broccoli trial, even at the one-leaf stage.

Weed control was exceptional in some of the treatments. One factor that may explain the difference with the results in the broccoli was that some of the fertilizer had a higher concentration of fines because it was the last of the fertilizer. We observed that this fertilizer dust adhered to the plants moreso than in the broccoli trial. Only two of the three plots were affected because the fertilizer fines fell from the applicator first, leaving the larger fertilizer particles. In any case it is doubtful that Goal impregnated fertilizer could be applied to emerging broccoli and cauliflower without serious injury to the crop, even without the increased activity of the fertilizer fines. Yield was not taken in this trial because club root also affected this planting.

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 fertlizer	0.25	Coty	23	0
2.	Goal impregnated fertlizer	0.5	Coty	73	0
3.	Goal impregnated fertlizer	0.25	2 leaf	0	0
4.	Goal impregnated fertlizer	0.5	2 leaf	53	0
5.	Goal impregnated fertlizer	0.25	4 leaf	0	7
6.	Goal impregnated fertlizer	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 fertlizer	0.25	Emerging	33	68
2. Goal impregnated fertlizer	0.5	Emerging	6	92
3. Goal impregnated fertlizer	0.25	Full cotyledon	29	40
4. Goal impregnated fertlizer	0.5	Full cotyledon	31	33
5. Check	-	-	37	2
FPLSD (0.05)			22	8

Table 3. Fertilizer and pyridate application data on broccoli.

	Impregnated fertilizer 1	Impregnated fertilizer 2	Impregnated fertilizer 3	Pyridate #1	Pyridate #2
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
Start/end time	1-2:00 PM	1:30-1:45 PM	6:15-6:30 AM	8-9:00 AM	6:15-6:30 AM
Air temp/soil temp.(2")/surface temp.	65/-/-	80/81/84	62/68/68	72/67/70	62/68/68
Rel humidity	70%	60%	80%	50 %	80%
Wind direction/velocity	W 5-10	W 3-5	0	E 0-2	0
Cloud cover	60%	70%	0	50 %	0
Soil moisture	moist surface	dry	Damp from dew	Dry	Damp from dew
Plant moisture	dry	possible wet spots	dew wet	Dry	dew wet
Sprayer/PSI				40	40
Mix size	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			400 ml/3 plots	321 ml/3 plots
Gallons H_2O/acre				25	25
Nozzle type				8003	8003
Nozzle spacing and height				20/18	20/18

Table 4. Impregnated fertilizer application data on cauliflower.

Application date	7/30/96	8/2/96
Application timing (crop stage)	Just emerging	Full cotyledon
Rel humidity	-	raining very lightly
Soil moisture	damp	wet
Plant moisture	dry	damp
Mix size	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	

Cucumber Herbicide Efficacy Field Study-1996

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Justification

Cucurbit growers have a limited number of herbicides to consider as alternatives to Amiben which was withdrawn a number of years ago. The currently registered products, Alanap, Prefar, Command and Curbit all have limitations in terms of weed control spectrum, method of application, crop safety or cost. Annual field trials, in which new products are tested and the application methods for registered herbicides refined, are essential in order to improve weed control strategies for cucurbit growers.

Objectives

The objectives of the 1996 field trial were to evaluate the effectiveness of two new chemicals; clomazone micro-encapsulated from FMC that can be incorporated with water, and United Agri Products numbered compound PCC 170. Clomazone ME has been tested in previous years whereas PCC 170 is a new product. The objective with clomazone ME was to establish a base rate for weed control that is as effective as the EC formulation. PCC 170 was to be evaluated in comparison to clomazone EC and ethalfluralin for crop safety and weed control effectiveness.

Methods

One trial was established at NWREC on 5/31/96 on a Willamette Silt Loam soil. The design was RCB with 3 replications. Individual plot dimensions were 5.5 x 60 ft. These dimensions were selected in order to duplicate grower conditions as much as possible, by using tractor-mounted equipment for all operations. The pre-plant treatments were applied with a tractor-mounted CO_2 sprayer to a disked field surface on 5/31/96 and incorporated 4 to 6 inches deep with a rotary tiller. One clomazone 0.25 PPI treatment was surface applied and shallowly incorporated by dragging a 6-ft section of chainlink fence behind a tractor. Each plot was seeded on 6/3/96 with 2 seed rows spaced 15 inches apart with the pickling cucumber variety, Pioneer. The pre-emergence treatments were applied immediately after seeding. The CO_2 sprayer was equipped with three-8002 fan nozzles spaced 19 inches apart set to deliver 600 ml of herbicide solution at 40 psi to each plot. Weather conditions at the time of application were; Air 78F, RH 70%, Soil 69F, Sun 100%, wind-slight breeze to the NE. Shallow incorporation was completed by dragging chainlink fence over those treatments for which it was required. The trial was irrigated with approximately one inch of water by overhead sprinklers following treatment applications. The plot was irrigated twice weekly for the first month and once a week thereafter. Urea was applied at a rate of 50 lb./acre preplant and on 6/27/96, which corresponded to the 2 to 3 true leaf stage and again on 7/17/96 at the runner stage of growth. The handweeded control was weeded mechanically and by hand on 7/15/96. Weeds were not removed from the other treatments.

Results

Phytotoxicity

All of the clomazone treatments showed typical marginal chlorosis of the cotyledons. The symptoms were not observed on subsequent growth. A few plants in areas were irrigation water accumulated in the 1x and 2x rates of PCC 170 died in the cotyledon to 1st true leaf stage. This was not observed in other treatments were puddling occurred. Stand counts were made on 6/14/96. Surprisingly, plant stands in the 1/2x PCC 170 treatment were significant lower than in the PCC 170 1x and the clomazone PPI shallow incorporated treatments. In the case of clomazone PPI, it was likely that the planter shoe plowed treated soil away from the seed lines resulting in better seed germination and survival. Initially, there was some concern that incorporation of PCC 170 might cause injury. However, other than the problem noted here, the stand counts seem to indicate otherwise.

Weed Control

Weeds present in the trial area included pigweed, dog fennel, shepherdspurse, lambsquarter, groundsel and some nightshade. Based upon observations and the weed density measurements, PCC 170 1x and 2x, clomazone ME and clomazone EC pre-emergence treatments provided the best weed control. The 1/2x rate of PCC 170 was much less effective than the higher rates. The weed density measurements were made late in the production cycle and therefore reflect the residual control of the treatments. Both pigweed and shepherdspurse are problem spring weeds whose control is critical. PCC 170 was very effective in providing long term control of these weeds. The most frequent weed escapes in the PCC 170 and the Prefar + Alanap treatments were shepherdspurse and dog fennel. In the clomazone ME and EC preemergence treatments the predominant escape was pigweed. Weed densities are included in the table below.

Yield

The plot was harvested on 8/19/96. Plants from a ten-foot section of both rows in each plot were stripped of all fruit and the fruit weighed. Cucumber fruits from all plots were pinched at the blossom end. This condition could have been caused by high temperatures during fruit set, insufficient irrigation or a lack of pollinators. Generally, yield was inversely correlated to weed population. The 1x rate of PC 170 yielded significantly more fruit than either of the clomazone PPI treatments and the ethalfluralin. The 2x rate was only better than the PPI rototilled clomazone and the ethalfluralin. The yield of the ME formulation was statistically comparable to all other treatments. Yield results are included in the table below.

Table 1. Pre-plant and pre-emergence herbicides applied to cucumbers-NWREC, 1996.

Treatment	Rate lb. ai/a	Mean Yield[1]	Weed Density[2]	Stand Count[3]
PCC 170 PREE [4]	1x	13.7 a	17 abc	64 a
PCC 170 PREE [4]	2x	12.5 ab	3 a	55 ab
PCC 170 PREE [4]	1/2x	11.8 abc	30 abcd	47 b
Clomazone EC PREE[4]	0.25	9.9 abcd	17 abc	57 ab
Clomazone ME PREE	0.33	9.6 abcde	7 ab	57 ab
Alanap+Prefar PPI Rototill	4 + 6	9.3 abcde	30 abcd	54 ab
Clomazone EC PPI [4]	0.25	7.5 bcde	34 abcd	62 a
Ethalfluralin EC PREE	0.75	7.1 cde	46 bcd	51 ab
Handweeded	---	6.8 cde	52 cd	58 ab
Weedy Control	---	5.6 de	41 abcd	61 ab
Clomazone EC PPI Rototill	0.25	3.9 e	71 d	54 ab
LSD 0.05		5.25	40.8	14.71

1. Mean of total fruit harvested for 10 ft of row/plot, kg.
2. Mean number of weeds/4 sq ft/plot.
3. Mean number of cucumber seedlings for 2-3 ft sections of each seedline/plot.
4. Chainlink fence drag incorporated.

Conclusions

The efficacy obtained with PCC 170 was better than either ethalfluralin or clomazone PPI. It provided good broad spectrum and long term weed control. Crop safety was not a problem with the exception of areas where water tended to puddle. By limiting competition from weeds, the PCC 170-treated plots yielded more than the other treatments. The broad spectrum of weeds controlled by PCC 170 would fit well in cucurbit production systems in Oregon and should be tested in future trials to confirm the 1996 results.

Currently, the label for clomazone specifies shallow incorporation. Deep incorporation as was achieved in this trial by using a rototiller, dramatically reduces its effectiveness. By using a chainlink fence drag, weed control was greatly improved which was demonstrated in 1995 and confirmed in this trial. The ME formulation of clomazone at 0.3 lb. ai/acre provided a very acceptable level of weed control in comparison to the EC preemergence shallow incorporated. The simplified application method for the ME formulation would be an advantage to growers in the northwest where spring rains can usually be expected. Future trials are needed to establish the upper rate limit on crop safety and plant-back as well as to confirm 1996 performance results.

Sweet Corn Tolerance to Herbicides

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Objectives

Evaluate tolerance of *Jubilee* and *Super Sweet Jubilee* sweet corn to dimethenamid (Frontier), acetochlor (Surpass), metolachlor II (Dual plus safener), nicosulfuron (Accent), halosulfuron (Battalion), FOE 5043 + metribuzin (Axiom), prosulfuron (Peak), and pyridate (Tough).

Methods

This trial was located on a silty clay loam soil at the Vegetable Research Farm near Corvallis, OR with 4 replications. *Jubilee* and *Super Sweet Jubilee* were planted on June 9, 1996 in two separate blocks on 30 inch rows. Fonofos (Dyfonate), an organophosphate insecticide that may intensify nicosulfuron injury to sweet corn, was incorporated before planting. Sweet corn seedlings were thinned to approximately equal populations within each plot shortly after emergence, and the plots were cultivated and hand-hoed to remove weeds not controlled by the herbicides.

Herbicides were applied with a unicycle plot sprayer except for the postemergence-directed (POSTD) treatments that were applied with a hand wand with 8003 nozzles. The wand was held so that the spray completely covered the plot area between rows but missed the corn whorl.

First ears of each plant were harvested on September 12. Because of an apparent root disease in some areas of the *Jubilee* field, some treatments only have 2 or 3 observations as noted in the column in Table 1 designated *n*. Plots that were visibly affected by the disease were not harvested and were located primarily in one replication on the west end of the field.

Results

Jubilee tolerance and yield (Table 1 and 2). Of the chloroacetamide treatments (acetochlor, metolachor, FOE 5043, and dimethenamid), dimethenamid PPI injured sweet corn most at 4 WAP.

At 8 WAP dimethenamid PPI, nicosulfuron broadcast with both dimethenamid and metolachlor, prosulfuron broadcast, and nicosulfuron applied with pyridate and atrazine significantly injured corn. Directing nicosulfuron reduced corn injury. However, variability in this plot was high because of poor planting conditions at one end of the field that increased corn injury overall.

Nicosulfuron (POST) reduced yield most in this trial, particularly when broadcast. Approximately 60 percent of the ears had visible nicosulfuron injury symptoms. Directing the nicosulfuron application maintained ear quality but a yield decrease was still apparent. Directing the application of prosulfuron also increased yield, although ear injury symptoms were not apparent with either directed or post-directed application.

Dimethenamid PPI decreased yield substantially. A similar trend was noted with acetochlor PPI. Halosulfuron POST also reduced sweet corn yield and ear quality but did not affect yield when applied PES.

Treatments with the greatest yield were the split application of metolachlor at the maximum use rate, the split treatment of metolachlor PPI and dimethenamid PES, and metolachlor plus halosulfuron PES.

Super Sweet Jubilee tolerance and yield (Table 3 and 4). No significant trends were noted for crop emergence. At 4 WAP there was evidence of injury in the dimethenamid and acetochlor treatments, but the injury was inconsistent across the four replications. At 8 WAP, injury was most severe in the nicosulfuron broadcast treatment but also was apparent in the halosulfuron POST treatment.

The FOE 5043 plus metribuzin treatment had the greatest yield at 9.8 t/ac followed closely by atrazine at 9.6 tons/ac. Nicosulfuron significantly decreased yield and ear quality whether applied as a directed or broadcast application. Surprisingly, broadcast prosulfuron did not reduce yield compared to the atrazine treatment and directing the application of prosulfuron had no effect on yield, a departure from the results of the same treatment on 'Jubilee' both this year and in 1995. As in the *Jubilee* trial, halosulfuron POST depressed sweet corn yield.

Discussion

Dimethenamid injury was greatest when applied PPI, a trend that has been evident the last three years but with some exceptions. Acetochlor was less likely to injure sweet corn than dimethenamid. Significant injury was seldom noted with metolachlor II (II product includes a safener for sweet corn).

Nicosulfuron injury was much greater than in previous years' research. No cob injury was observed in 1995 with the same set of treatments whether the herbicide was directed or broadcast. Dyfonate was applied each year to control soil insects. Possible explanations include the severe temperature shifts of mid-July that may have stressed the corn. Moisture was maintained throughout the season with approximately one inch applied per week. Injury was no greater in the *Super Sweet Jubilee* than in the *Jubilee* trial.

Halosulfuron injured corn and reduced yield when applied POST but not when applied PES.

Pyridate injury was usually visible just after application but did not significantly reduce yield in either variety. Pyridate plus nicosulfuron plus atrazine significantly injured sweet corn early in the seasons and caused multiple ears to form, but did not reduce yield.

FOE 5043 plus metribuzin (Axiom) did not injure corn early in the season but may have reduced yield in the *Jubilee* trial. There was no injury or yield reduction from Axiom in the *Super Sweet Jubilee* trial, and this treatment had the highest yield. The primary difference between the *Jubilee* and *Super Sweet Jubilee* site was the root disease that impacted crop yields in the *Jubilee* trial, and this soil factor may have interacted with the Axiom treatment to slightly reduce yield.

Table 1. Crop emergence and *Jubilee* sweet corn injury at 4 and 8 WAP, Corvallis, OR, 1996.

	Herbicide	Timing[1]	Rate	Emergence[2]	Crop injury	
					4 WAP[1]	8 WAP
			lbs ai/ac	no./ 7 ft of row	------ % -------	
1.	Dimethenamid	PPI	1.2	14	18	33
2.	Dimethenamid	PES	1.2	12	8	28
3.	Dimethenamid Dimethenamid	PPI PES	0.8 0.4	15	4	20
4.	Metolachlor II	PPI	2.0	14	8	23
5.	Metolachlor II	PES	2.0	14	6	18
6.	Metolachlor II Metolachlor II	PPI PES	2.0 2.0	11	5	15
7.	Metolachlor II Dimethenamid	PPI PES	2.0 1.2	14	5	20
8.	Acetochlor	PPI	2	14	3	18
9.	Acetochlor	PES	2	10	11	8
10.	Metolachlor II Pyridate	PES EPOST	2.0 0.47	POST treatments not applied at this point		5
11.	Metolachlor II Nicosulfuron (directed)	PES POSTD	2.0 0.031	↓	↓	13
12.	Metolachlor II Nicosulfuron (broadcast)	PES POSTB	2.0 0.031	↓	↓	43
13.	Dimethenamid Nicosulfuron (broadcast)	PES POSTB	1.2 0.031	↓	↓	48
14.	Acetochlor Nicosulfuron (broadcast)	PES POSTB	2.0 0.031	↓	↓	28
15.	FOE 5043 Metribuzin	PES	18 oz/acre	16	8	13
16.	Metolachlor II Prosulfuron (broadcast)	PES POSTB	2.0 0.0179	↓	↓	35
17.	Metolachlor II Prosulfuron (directed)	PES POSTD	2.0 0.0179			20
18.	Metolachlor II Halosulfuron	PES PES	2.0 0.075	17	0	13
19.	Metolachlor II Halosulfuron (broadcast)	PES POSTB	2.0 0.032	↓	↓	28
20.	Atrazine Nicosulfuron Pyridate	EPOST EPOST EPOST	0.5 0.031 0.47	↓	↓	33
21.	Pyridate	EPOST	0.47			23
22.	Atrazine	PES	1.0	14	8	5
23.	Untreated[4]			16	0	8
	FPLSD (0.05)			-	9	24

[1] PPI=pre plant incorporated; PES=preemergence surface; EPOST=early postemergence; POST=Postemergence directed with one nozzle/row.
[2] Values in this column do not include effect of postemergence herbicides.
[3] Foe 5043+metribuzin (Axiom) applied at 18 oz/ac
[4] Eight observations for this treatment, 4 observations for other treatments.

Table 2. *Jubilee* sweet corn tolerance to herbicides, Vegetable Res. Farm Corvallis OR, 1996.

Herbicide	Timing	Rate	*n*	Number of ears	Gross yield	Ear quality	Tip fill	Maturity
		lbs ai/ac			-t/ac-	(10=normal)	(10=filled)	(10=mature)
1. Dimethenamid	PPI	1.2	3	17	6.8 [1]	10	7	10
2. Dimethenamid	PES	1.2	3	18	7.8 a	10	8	10
3. Dimethenamid Dimethenamid	PPI PES	0.8 0.4	3	18	8.0 a	10	10	10
4. Metolachlor II	PPI	2.0	2	18	8.1 a	10	10	10
5. Metolachlor II	PES	2.0	2	18	7.7 a	10	5	10
6. Metolachlor II Metolachlor II	PPI PES	2.0 2.0	3	21	8.9 a	10	9	9
7. Metolachlor II Dimethenamid	PPI PES	2.0 1.2	3	19	8.5 a	10	8	10
8. Acetochlor	PPI	2.0	4	17	7.2 a	10	10	10
9. Acetochlor	PES	2.0	3	20	8.3 a	10	7	9
10. Metolachlor II Pyridate	PES EPOST	2.0 0.47	3	19	8.2 a	10	7	10
11. Metolachlor II Nicosulfuron (directed)	PES POSTD	2.0 0.031	3	16	7.0 a	10	10	8
12. Metolachlor II Nicosulfuron (broadcast)	PES POSTB	2.0 0.031	2	16	6.0	4	7	6
13. Dimethenamid Nicosulfuron (broadcast)	PES POSTB	1.2 0.031	3	16	6.8 a	6	9	8
14. Acetochlor Nicosulfuron(broadcast)	PES POST	2.0 0.031	3	17	6.2	2	7	10
15. FOE 5043 Metribuzin	PES	18 oz [2]	3	18	7.2	10	10	8
16. Metolachlor II Prosulfuron (broadcast)	PES POST	2.0 0.0179	3	16	7.0 a	10	8	10
17. Metolachlor II Prosulfuron (directed)	PES POSTD	2.0 0.0179	2	19	8.1a	10	9	9
18. Metolachlor II Halosulfuron	PES PES	2.0 0.075	3	21	8.6	10	9	10
19. Metolachlor II Halosulfuron(broadcast)	PES POSTB	2.0 0.032	3	17	6.8	9	8	10
20. Atrazine Nicosulfuron Pyridate	EPOST EPOST EPOST	0.5 0.031 0.47	2	22	8.0 a	10	9	10
21. Pyridate	EPOST	0.47	3	19	8.3	10	7	10
22. Atrazine	PES	1.0	2	19	8.2	10	7	10
23. Untreated check	-	-	7	18	7.9 a	10	10	10
FPLSD (0.05)				NS	NS	0.6	NS	NS

[1] Values in the same column followed by the same letter are not statistically different from the untreated check using number of ears as the covariant.
[2] Foe 5043+metribuzin (Axiom) applied at 18 oz/ac

Table 3. Crop emergence and injury at 4 and 8 WAP in Super Sweet Jubilee, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Crop emergence[1]	Crop injury	
				4 WAP[1]	8 WAP
			7 ft or row	-----------%-------------	
1. Dimethenamid	PES	1.2	13	15	5
2. Metolachlor II	PES	2.0	12	8	3
3. Acetochlor	PES	2.0	13	13	10
4. Metolachlor II Dimethenamid	PPI PES	2.0 1.2	13	5	1
5. Metolachlor II Pyridate	PES EPOST	2.0 0.47	POST not applied at this evaluation		8
6. Metolachlor II Nicosulfuron (directed)	PES POSTD	2.0 0.031	↓	↓	15
7. Metolachlor II Nicosulfuron (broadcast)	PES POSTB	2.0 0.031	↓	↓	23
8. Metolachlor II Prosulfuron (broadcast)	PES POSTB	2.0 0.0179	↓	↓	10
9. Metolachlor II Prosulfuron (directed)	PES POSTD	2.0 0.0179	↓	↓	5
10. FOE 5043 Metribuzin	PES	18 oz/acre[2]	13	3	3
11. Metolachlor II Halosulfuron	PES POSTB	2.0 0.032	↓	↓	18
12. Atrazine	PES	1.0	15	6	0
FPLSD (0.05)			NS	NS	13

[1] Values in this column do not include effect of postemergence herbicides.
[2] Foe 5043+metribuzin (Axiom) applied at 18 oz/ac

Table 4. Herbicide impact on *Super Sweet Jubilee* sweet corn yield on soil treated with fonofos (Dyfonate), Veg. Res. Farm, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Gross yield	Number of ears/plot	Ear Quality	Tip fill
		lbs ai/ac	- t/ac -		(10=normal)	(10=filled)
1 Dimethenamid	PES	1.2	8.1	19	10	9
2 Metolachlor II	PES	2.0	9.4 a[1]	20	10	10
3 Acetochlor	PES	2.0	9.5 a	21	10	7
4 Metolachlor II Dimethenamid	PPI PES	2.0 1.2	9.7 a	21	10	9
5 Metolachlor II Pyridate	PES EPOST	2.0 0.47	8.7 a	19	10	9
6 Metolachlor II Nicosulfuron (directed)	PES POSTD	2.0 0.031	7.1	16	6	10
7 Metolachlor II Nicosulfuron (broadcast)	PES POSTB	2.0 0.031	7.5	21	2	8
8 Metolachlor II Prosulfuron (broadcast)	PES POSTB	2.0 0.0179	9.4 a	22	10	10
9 Metolachlor II Prosulfuron (directed)	PES POSTD	2.0 0.0179	9.2 a	19	10	9
10 FOE 5043 Metribuzin	PES	18 oz [2]	9.8 a	20	10	10
11 Metolachlor II Halosulfuron	PES POSTB	2.0 0.032	8.3 a	19	10	10
12 Atrazine	PES	1.0	9.6 a	20	10	10
FPLSD (0.05)				NS	2	NS

[1] Values in the same column followed by an asterisk are not statistically different from the atrazine treatment using covariant analysis with ear number as the covariant.

[2] Foe 5043+metribuzin (Axiom) applied at 18 oz/ac

Table 5. Herbicide application record for Super Sweet Jubilee sweet corn trial.
Planting date: 6/4/96
Location: Vegetable Research Farm, Corvallis, OR

Application date	6/3/96	6/4 /96	7/4/96	7/11/96
Application timing	PPI	PES	EPOST 8-10"	POST (D/B)[1]12-16 "
Start/end time	11:45-12:00	8:00-9:00A	7:00-8:00 A	6:30-7:30
Air temp/soil temp.(2")/surface temp.	76/72/-	60/64/60	67/67/70	55/-/-
Rel humidity	60%	60%	50%	-
Wind direction/velocity	SW 2-4, gust to 6	W 0-3	NE 0-2	-
Cloud cover	50	100	50	-
Soil moisture	dry surface	light moisture	dry	-
Plant moisture	---	---	Dry	-
Sprayer/PSI	Unicycle/40	Unicycle/40	Unicycle/40	Backpack
Mix size	2000/ml 4 plots	2000 ml/4 plots	-------------->	3785 ml
Gallons H_2O/acre	30/acre	30 gal/acre	-------------->	25 gpa
Nozzle type	8003	8003	8003	8002
Nozzle spacing and height	19/17	19/17	19/17	20/18, 30 spacing for POSTD
Soil inc. depth (PPI/PRE)	2"	-	-	-
Soil inc. method/implement	rotara	Irrigation 0.5 inches	-	

Table 6. Herbicide application record for Jubilee sweet corn trial.
Planting date: 6/4/96
Location: Vegetable Research Farm, Corvallis, OR

Application date	6/3/96	6/4 /96	7/4/96	7/11/96
Application timing	PPI	PES	EPOST 8-10"	POST(D/B)[1] 12-16"
Start/end time	6-7:00 A	8:00-9:00A	8:00-9:00 A	6:30-7:30
Air temp/soil temp.(2")/surface temp.	58/56/55	67/70/70	67/67/70	55/-/-
Rel humidity	60%	62%	50%	-
Wind direction/velocity	0	NE 2	NE 0-2	-
Cloud cover	50	50	50	-
Soil moisture	moist surface	very dry	dry	-
Plant moisture	---	---	dry	-
Sprayer/PSI	Unicycle/40	Unicycle/40	Unicycle/40	Backpack
Mix size	2000/ml 4 plots	2000 ml/4 plots	-------------->	3785 ml
Gallons H_2O/acre	26/acre	26 gal/acre ----	-------------->	25 gpa
Nozzle type	8003	8003	8003	8002
Nozzle spacing and height	20/18	20/18	20/18	20/18, 30" spacing for POSTD
Soil inc. depth (PPI/PRE)	2"	-	-	-
Soil inc. method/implement	rotara	Irrigation 0.5"	-	-

[1] POSTD=postdirected spray to keep herbicide out of the corn whorl; POSTB=broadcast.

Wild Proso Millet Control in Sweet Corn

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Objective

Evaluate dimethenamid (Frontier), acetochlor (Surpass), nicosulfuron (Accent), and FOE 5043+metribuzin (Axiom) for wild proso millet control and effect on sweet corn growth and yield.

Methods

The experiment site was near Stayton, OR on a gravely loam soil with 9% OM, 21 meq/100g CEC, and pH of 6.3. Corn was planted on 36 inch rows. Rates used in this trial represent comparative labeled rates for each herbicide for this soil type. Rates for the chloroacetamide herbicides are adjusted to approximately the same cost/acre for each herbicide. Table 1 lists unregistered or uncommon herbicides used in this trial. Insecticides were not applied to this soil.

Wild proso millet (WPM) seedlings were counted in 11 ft^2 quadrats in each plot at 3 WAP and visual evaluations of WPM control made at 4 and 6 WAP. Plots that had the potential to produce more millet seed than the growers' treatment were killed with glyphosate in mid-season. The first ears of each stalk were harvested from the remaining treatments. WPM seed culms also were harvested to estimate the relative effectiveness of herbicides to control WPM seed production. The plots were managed by the grower with his equipment and were not cultivated.

Results and discussion

Weed control. Wild proso millet (WPM) was the primary weed at this site and the population density relatively uniform across all four blocks. Generally, acetochlor controlled WPM better than dimethenamid, and dimethenamid controlled WPM better than metolachlor.

Promising treatments at 4 WAP in order of WPM suppression were EPTC PPI + acetochlor PES, a split application of acetochlor (PPI + PES), EPTC PPI + dimethenamid PES, EPTC PPI and metolachlor PES, and metolachlor PPI + dimethenamid PES. However, at 6 WAP only EPTC PPI + acetochlor PES had maintained an acceptable level of WPM control. At harvest EPTC PPI and acetochlor compared favorably to treatments with nicosulfuron, which generally had the best WPM control. The grower treatment of EPTC and metolachlor PPI + ametryn (Evik) provided an exceptional level of WPM control at harvest. The number of observations for weed control at harvest (Table 4) is an indication of the success of these treatments because only treatments with acceptable weed levels were allowed to remain throughout the season. It is apparent from this data that EPTC PPI + acetochlor PES had very consistent weed control.

Yields were variable within plots because of stalk-rot disease, and consistent yield trends were not apparent. Nonetheless, nicosulfuron alone or in combination with other herbicides did not reduce yield. The lowest yields were EPTC PPI + dimethenamid (PES) and the growers' treatment.

Though yield was not affected by nicosulfuron treatments, injury symptoms were apparent when nicosulfuron was applied with pyridate and atrazine (multiple ear effect, most severe injury recorded) and when applied broadcast (misshapen ears). Applying nicosulfuron with other postemergence herbicides such as pyridate may not be possible because of the potential to aggravate injury to sweet corn.

Table 1. Proso millet control in sweet corn, Stayton, OR, 1996

Herbicide	Timing	Rate	Proso millet emergence (3 WAP)	Millet control (4 WAP)	Millet control (6 WAP)
		lb/A	no./11 ft^2	%	%
1. Dimethenamid	PPI	1.2	15	90	48
2. Dimethenamid	PES	1.2	11	81	40
3. Dimethenamid	PPI	0.8	9	91	50
Dimethenamid	PES	0.4			
4. Dimethenamid	PES	2.5	6	85	50
Atrazine					
5. Dimethenamid	PPI	1.65[1]	4	88	70
Atrazine	PPI				
Dimethenamid	PES	0.825			
Atrazine	PES				
6. Metolachlor II	PPI	2.00	20	61	15
7. Metolachlor II	PES	2.00	49	56	30
8. Metolachlor II	PPI	1.3	19	76	55
Metolachlor II	PES	0.7			
9. Metolachlor II	PPI	2.00	1	94	75
Metolachlor II	PES	2.00			
10. Metolachlor II	PES	2.0	41	73	20
Atrazine	PES	1.1			
11. Metolachlor II	PPI	2	2	95	82
Dimethenamid	PES	1.2			
12. Acetochlor	PPI	2	2	86	58
13. Acetochlor	PES	2	1	92	73
14. Acetochlor	PPI	1.3	0	95	93
Acetochlor	PES	0.7			

[1] Dimethenamid + atrazine = Guardsman. The rate here is lb ai/ac of Guardsman.

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Herbicide	Timing	Rate	Proso millet emergence (3 WAP)	Millet control (4 WAP)	Millet control (6 WAP)
15. Acetochlor	PES	2.0	0	100	99
EPTC		4.2			
16. Dimethenamid	PES	1.2	1	95	81
EPTC	PPI	4.2			
17. Metolachlor II	PES	2.0	5	95	80
EPTC	PPI	4.2			
18. Pyridate	EPOST	0.47	Not applied at this evaluation		98
Atrazine	EPOST	0.5			
Nicosulfuron	EPOST	0.031			
19. Acetochlor	PES	2.0	EPOST not applied at this evaluation		100
Nicosulfuron	EPOST	0.031			
20. Acetochlor	PES	2.0	LPOST not applied at this evaluation		86
Nicosufuron	LPOST	0.03			
21. FOE 5043	PES	16 oz	11	56	45
Metribuzin					
22. FOE 5043	PES	18 oz	9	68	33
Metribuzin					
23. Pendimethalin	PES	1.5	8	74	40
Atrazine	PES	0.5			
24. Nicosulfuron	EPOST	0.031	Not applied at this evaluation		74
25. Check	-	-	21	0	0
Anova (treatment)			0.05	0.0001	0.0001
LSD (0.05)			33	15	35

Table 2. Corn emergence, growth, and yield in WPM control trial, Stayton, OR, 1996.

Herbicide	Timing	Rate	Corn emergence (3 WAP)	Corn growth reduction (4 WAP)	Grower evaluation of growth and weed control (5 WAP)
		lbs/A	no./7 ft of row	%	5 = excellent; 1= unacceptable
1. Dimethenamid	PPI	1.2	14	5	1.1
2. Dimethenamid	PES	1.2	11	0	1.2
3. Dimethenamid	PPI	0.8	12	1	1.8
Dimethenamid	PES	0.4			
4. Dimethenamid	PES	2.5	13	0	2.6
Atrazine					
5. Dimethenamid	PPI	1.65[1]	13	6	2.6
Atrazine	PPI				
Dimethenamid	PES	0.825			
Atrazine	PES				
6. Metolachlor II	PPI	2.0	12	6	1.1
7. Metolachlor II	PES	2.0	12	0	1.0
8. Metolachlor II	PPI	1.3	13	0	1.3
Metolachlor II	PES	0.7			
9. Metolachlor II	PPI	2.0	11	0	2.7
Metolachlor II	PES	2.0			
10. Metolachlor II	PES	2.0	13	0	1.0
Atrazine	PES	1.1			
11. Metolachlor II	PPI	2.0	13	0	4.1
Dimethenamid	PES	1.2			
12. Acetochlor	PPI	2.0	13	3	3.6
13. Acetochlor	PES	2.0	12	0	3.6
14. Acetochlor	PPI	1.3	14	6	3.9
Acetochlor	PES	0.7			
15. Acetochlor	PES	2.0	13	3	4.5
EPTC	PPI	4.2			
16. Dimethenamid	PES	1.2	14	0	3.8
EPTC	PPI	4.2			
17. Metolachlor II	PES	2.0	12	3	3.5
EPTC	PPI	4.2			

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[1] Dimethenamid + atrazine = Guardsman. The rate here is lb ai/ac of Guardsman.

Herbicide	Timing	Rate	Corn emergence (3 WAP)	Corn growth reduction (4 WAP)	Grower evaluation of corn growth and weed control (5 WAP)
18. Pyridate	EPOST	0.47	Not applied at this evaluation		4.0
Atrazine	EPOST	0.5			
Nicosulfuron	EPOST	0.031			
19. Acetochlor	PES	2.0			4.9
Nicosulfuron	EPOST	0.031	EPOST not applied at this evaluation		
20. Acetochlor	PES	2.0			4.5
Nicosufuron	LPOST	0.031	LPOST not applied at this evaluation		
21. FOE 5043	PES	16 oz	13	5	3.1
Metribuzin					
22. FOE 5043	PES	18 oz	11	5	2.5
Metribuzin					
23. Pendimethalin	PES	1.5	12	0	3.0
Atrazine	PES	0.5			
24. Nicosulfuron	EPOST	0.031			3.8
25. Check	-	-	-	-	0.9
Anova			0.63	0.28	
LSD (0.05)			ns	ns	

Table 3. Sweet corn yield and proso millet control in Stayton, OR, 1996

No.	Herbicide	Timing	Rate	No. of obs.	Number of ears	Ear yield	Average ear wt	Ear quality rating[1]	Proso millet seed culm wt at harvest
			lbs/A		no./16' of row	t/ac	lbs	10=excellent	g/16 of row
11.	Metolachlor II Dimethenamid	PPI PES	2.0 1.2	3	28	10.7	0.73	9.5	30[2] ab
13.	Acetochlor	PES	2.0	2	26	9.5	0.73	10.0	69 ab
14.	Acetochlor Acetochlor	PPI PES	1.3 0.7	3	30	11.7	0.74	10.0	98 a
15.	Acetochlor EPTC	PES PPI	2.0 4.2	4	27	10.0	0.68	9.0	8 b
16.	Dimethenamid EPTC	PES PPI	1.2 4.2	2	27	9.0	0.66	10.0	58 ab
17.	Metolachlor II EPTC	PES PPI	2.0 4.2	3	30	10.5	0.66	9.5	55 ab
18.	Pyridate Atrazine Nicosulfuron	EPOST EPOST EPOST	0.47 0.5 0.031	3	27	10.3	0.66	8.3	4 b
19.	Acetochlor Nicosulfuron	PES EPOST	2.0 0.031	3	23	9.9	0.81	9.0	0 b
20.	Acetochlor Nicosufuron (directed)	PES LPOST	2.0 0.031	2	28	10.8	0.73	10.0	0 b
26.	EPTC[3] Metolachlor Ametryn	PPI PPI LPOST	3.35 1.0 2.0	4	25	8.9	0.68	9.5	1 b
	Anova for treatment				0.48	0.12	0.32	0.38	0.05
	LSD (0.05)				-	-	-	-	

[1] This rating was primarily to detect injury from nicosulfuron. A rating of 10 indicates no nicosulfuron injury visible.
[2] Numbers in this column followed by the same letter do not differ with Duncan's multiple range test (0.05).
[3] Grower applied treatment.

Table 4. Herbicide application record.

	Application 1	Application 2	Application 3	Application 4
Application date	5/31/96	6/2/96	6/26/96	7/15/96
Application timing	PPI	PES	EPOST 8" corn	LPOST directed application on 16" corn
Start/end time	11-12:30	7:30-10:00A	9:00-9:30	7-7:30A
Air temp/soil temp (2")	71/64	75/78/97	72/80/87	72/-/-
Rel humidity	62%	50%	48%	60%
Wind direction/velocity	SW, gust to 6	N/2-5	E/ 0-2	S/3-5
Cloud cover	40	0	10	0
Soil moisture	dry surface	dry	wet	damp
Plant moisture	---	---	dew on plants	dew
Sprayer/PSI	Unicycle/40	Unicycle/40	Unicycle/40	backpack sprayer
Mix size	2000/ml 4 plots	2000 ml/4 plots -----	2000 ml/4 plots	750 ml
Gallons H_2O/acre	38/acre	38 gal/acre ------ -----		10 GPA
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	19/17	19/17	19/17	36/ directed
Soil inc. depth (PPI/PES)	3"	-	-	-
Soil inc. method/implement	with rototiller	Irrigation 0.5"	-	-

PPI: EPTC incorporated within 45 minutes.

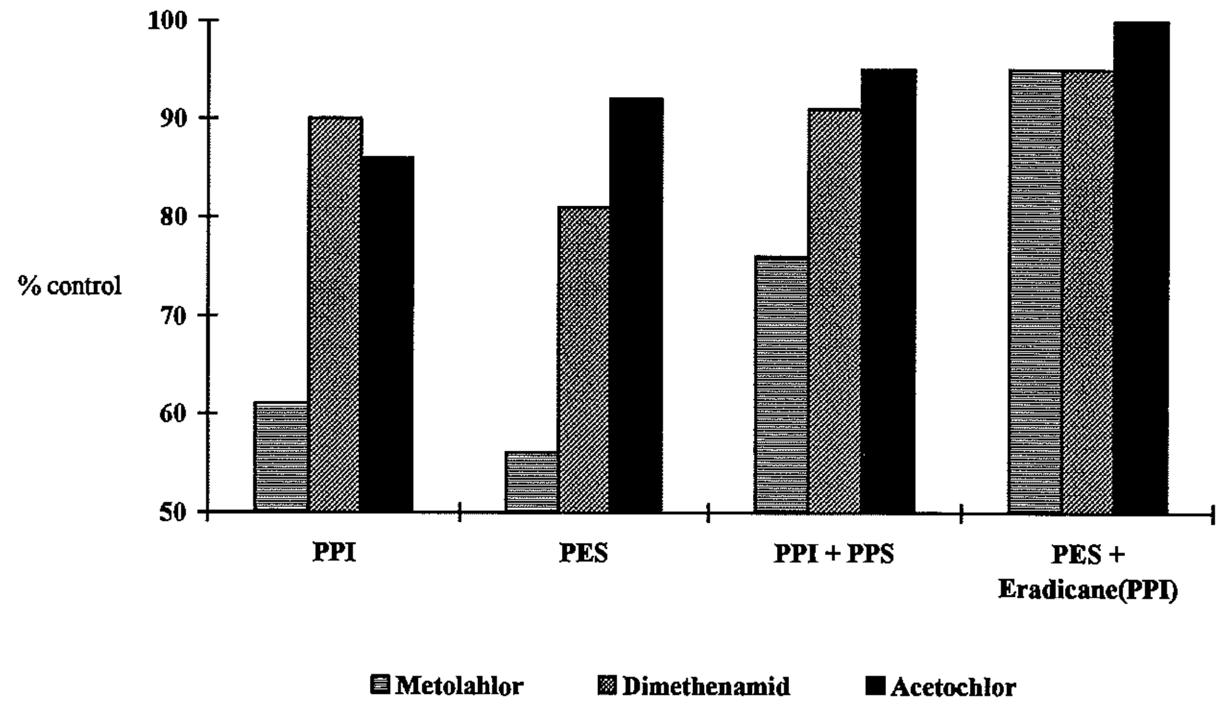

Figure 1. Proso millet control with three application timings and Eradicane.

Pigweed Control in Sweet Corn with Herbicides

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Objectives

Evaluate dimethenamid (Frontier), acetochlor (Surpass), nicosulfuron (Accent), halosulfuron (Battalion), FOE 5043 + metribuzin (Axiom), dimethenamid + atrazine (Guardsman), metolachlor + atrazine (Bicep II), and pyridate (Tough) for both weed control efficacy and effect on sweet corn growth, with particular emphasis on atrazine tolerant pigweed control and potential injury to sweet corn with nicosulfuron.

Methods

This trial was located on a sandy loam soil with 4% OM, 19.5 meq/100g CEC, and pH 5.3 near Monroe, OR with 4 replications. *Jubilee* sweet corn was planted on June 9 on 36 inch rows without soil insecticides. Pigweed with some level of atrazine tolerance, nightshade, bindweed, and crabgrass were the primary weeds present.

Herbicides were applied with a unicycle plot sprayer except for the POST-directed treatments that were applied with back-pack sprayer and hand-held spray wand. The hand-wand was held so that the spray completely covered the plot area between rows but missed the corn whorl.

First ears of each plant were harvested on September 12 from selected treatments in three of four replications; one replication was moderately damaged by misapplied irrigation. An overall weed control estimate is included in the yield table that may help to explain yield reductions in some treatments.

Results and Discussion

PPI and PES weed control (Table 1). Dimethenamid plus atrazine completely controlled pigweed throughout the season even though a moderate level of atrazine tolerance was noted. Metolachlor plus atrazine provided 95 percent pigweed control (Table 1). Dimethenamid alone controlled pigweed better than metolachlor whether PPI, PES or as a split application. Acetochlor however, was most effective of the chloroacetimides. Pigweed control with FOE 5043 + metribuzin was slightly better than metolachlor but did not control nightshade.

POST weed control (Table 2). The most effective pigweed treatments at harvest were acetochlor (PES) + nicosulfuron (POST) and pyridate plus atrazine (EPOST). The addition of prosulfuron or halosulfuron POST to metolachlor (PES) significantly improved pigweed control. Pyridate (EPOST) alone did not control pigweed but in combination with atrazine greatly improved atrazine efficacy. Pyridate plus Guardsman PES (dimethenamid + atrazine) did not improve total weed control at harvest compared to Guardsman alone. Combinations of pyridate with nicosulfuron also did not improve pigweed control at this site, but may broaden the spectrum to weeds such as lambsqaurter. The EPOST application of nicosulfuron provided exceptional control of pigweed until harvest, but overall weed control was less than optimal.

Crop tolerance and yield (Tables 3 - 5). Nicosulfuron POST injured sweet corn most in this trial at 8 WAP (Table 4) and reduced ear yield, quality, and weight. Nicosulfuron applied EPOST (Table 5) slightly injured corn at 8 WAP compared to the POST application, but did not significantly affect yield. The application of Guardsman (Tr. 5) also injured the corn but did not significantly reduce yield.

The directed application of prosulfuron decreased injury symptoms slightly early in the season compared to broadcast prosulfuron, but directing prosulfuron did not improve yield compared to the broadcast application, probably because of poorer weed control in the broadcast treatment. The highest yield was with pyridate + atrazine + nicosulfuron (EPOST) at 10.7 t/ac with no injury apparent to the corn ears. However, at another site this same treatment caused a multiple ear syndrome.

Table 1. Preplant incorporated and premergence weed control estimate at 4 WAP, Monroe OR. Planted on June 9, 1996.

Herbicide	Timing	Rate	Weed control 5 WAP (July 13)			Weed control at harvest
			Pigweed	Nightshade	Grasses	Pigweed
		lbs ai/ac	% control			
1. Dimethenamid	PPI	0.94	80	100	93	73
2. Dimethenamid	PES	0.94	100	100	68	99
3. Dimethenamid Dimethenamid	PPI PES	0.62 0.31	100	88	83	95
4. Dimethenamid Atrazine	PES	0.94 1.06	98	100	95	100
5. Dimethenamid[1] Atrazine Dimethenamid Atrazine	PPI PES	1.32[2] 0.66	95	99	90	89
6. Metolachlor II	PPI	1.46	60	65	65	43
7. Metolachlor II	PES	1.46	71	73	93	61
8. Metolachlor II Metolachlor II	PPI PES	0.96 0.48	89	73	98	55
9. Metolachlor II Metolachlor II	PPI PES	1.46 1.46	90	83	97	75
10. Metolachlor II[3] Atrazine	PES PES	1.46[4] 1.18	91	100	93	95
11. Acetochlor	PPI	1.25	93	93	100	85
12. Acetochlor	PES	1.25	95	95	70	92
13. Acetochlor Acetochlor	PPI PES	0.83 0.41	100	100	98	100
14. Acetochlor Atrazine	PES PES	1.25 1.18	86	100	88	75
15. FOE 5043 Metribuzin	PES	13 oz/acre[5]	79	78	48	53
16. FOE 5043 Metribuzin	PES	15 oz acre	80	33	80	65
30. Atrazine	PES	1.18	53	90	67	51
31. Check	-	-	0	0	0	0
FPLSD (0.05)			19	26	32	30

[1] Dimethenamid plus atrazine in a ratio equal to that in Guardsman.
[2] Guardsman rate.
[3] Metolchlor and atrazine ratio equal to that in Bicep.
[4] Bicep rate.
[5] FOE 5043 +metribuzin applied at 13 or 15 oz of product/ac.

Table 2. Postemergence weed control in sweet corn, Monroe OR. Planted on June 9, 1996.

Herbicide	Timing	Rate	Weed control 5 WAP (July 13)			Weed control at harvest
			Pigweed	Nightshade	Grasses	Pigweed
		lbs ai/ac	% control			
17. Pyridate	EPOST	0.47	100	95	100	98
Atrazine	EPOST	0.50				
Nicosulfuron	EPOST	0.03				
18. Dimethenamid	PES	0.94	Not applied at this date			98
Pyridate	POST	0.47				
Atrazine	POST	1.00				
19. Pyridate	EPOST	0.47	100	100	98	94
Nicosulfuron	EPOST	0.03				
20. Acetochlor	PES	1.25	Not applied at this date			100
Nicosulfuron (broadcast)	POST	0.03				
21. Metolachlor II	PES	0.73	Not applied at this date			91
Prosulfuron (broadcast)	POST	0.02				
22. Metolachlor II	PES	0.73	Not applied at this date			80
Prosulfuron (directed)	POST	0.018				
23. Metolachlor II	PES	0.73	Not applied at this date			98
Halosulfuron	POST	0.03				
24. Dimethenamid	PES	0.94	Not applied at this date			95
Bentazon (Laddock)	POST	1.04				
Atrazine	POST					
25. Metolachlor II	PES	1.46	Not applied at this date			98
Bentazon (Laddock)	POST	1.04[1]				
Atrazine						
26. Nicosulfuron	EPOST	0.03	100	100	95	99
27. Nicosulfuron	POST	0.03	Not applied at this date			53
28. Pyridate	EPOST	0.47	53	88	13	35
29. Pyridate	EPOST	0.47	100	100	50	100
Atrazine		1.18				
30. Atrazine	PES	1.18	53	90	67	51
31. Check	-	-	0	0	0	0
FPLSD (0.05)			19	26	32	30

[1] Laddock rate.

Table 3. Sweet corn emergence and injury evaluation of preemergence herbicide treatments at Monroe OR, 1996.

Herbicide	Timing	Rate	Emergence	Crop injury evaluation		
				2 WAP	4 WAP	8WAP
		lbs ai/ac	no./ 7 ft row	--% reduction in growth--		
1. Dimethenamid	PPI	0.94	17	1	4	5
2. Dimethenamid	PES	0.94	17	0	1	4
3. Dimethenamid Dimethenamid	PPI PES	0.62 0.31	18	1	1	0
4. Dimethenamid Atrazine	PES	2.00	17	0	4	0
5. Dimethenamid Atrazine Dimethenamid Atrazine	PPI PES	1.32 0.66	16	4	5	16
6. Metolachlor II	PPI	1.46	16	0	3	0
7. Metolachlor II	PES	1.46	17	1	1	0
8. Metolachlor II Metolachlor II	PPI PES	0.96 0.48	16	0	5	0
9. Metolachlor II Metolachlor II	PPI PES	1.46 1.46	20	0	6	3
10. Metolachlor II Atrazine	PES PES	1.46 1.18	16	5	6	3
11. Acetochlor	PPI	1.25	17	1	5	10
12. Acetochlor	PES	1.25	17	0	1	0
13. Acetochlor Acetochlor	PPI PES	0.83 0.41	17	1	6	4
14. Acetochlor Atrazine	PES PES	1.25 1.18	15	0	4	2
15. FOE 5043 Metribuzin	PES	13 oz/acre	17	0	0	0
16. FOE 5043 Metribuzin	PES	15 oz acre	17	0	5	6
30. Atrazine	PES	1.18	18	1	4	5
31. Check	-	-	19	1	1	0
FPLSD (0.05)			-	NS	NS	9.0

Table 4. Injury evaluation of postemergence treatments on sweet corn at Monroe OR, 1996.

Herbicide	Timing	Rate	Crop injury evaluation 8WAP
17. Pyridate	EPOST	0.47	1
Atrazine	EPOST	0.50	
Nicosulfuron	EPOST	0.03	
18. Dimethenamid	PES	0.94	4
Pyridate	POST	0.47	
Atrazine	POST	1.00	
19. Pyridate	EPOST	0.47	0
Nicosulfuron	EPOST	0.03	
20. Acetochlor	PES	1.25	5
Nicosulfuron	POST	0.03	
21. Metolachlor II	PES	0.73	6
Prosulfuron (broadcast)	POST	0.02	
22. Metolachlor II	PES	0.73	3
Prosulfuron (directed)	POST	0.018	
23. Metolachlor II	PES	0.73	0
Halosulfuron	POST	0.03	
24. Dimethenamid	PES	0.94	10
Bentazon (Laddock)	POST	1.04	
Atrazine	POST		
25. Metolachlor II	PES	1.46	11
Bentazon (Laddock)	POST	1.04	
Atrazine	POST		
26. Nicosulfuron	EPOST	0.03	5
27. Nicosulfuron	POST	0.03	20
28. Pyridate	EPOST	0.47	2
29. Pyridate	EPOST	0.47	17
Atrazine		1.18	
30. Atrazine	PES	1.18	5
31. Check	-	-	0
FPLSD (0.05)			9.0

Table 5. Sweet corn yield in selected treatments at Monroe OR, 1996

	Herbicide	Timing	Rate	Number of ears	Average ear wt	Ear yield	Ear quality rating	Total weed control at harvest
				no/12' of row	gr.	t/ac	10 = normal; 8 = unacceptable	%
1.	Dimethenamid	PPI	0.94	22	364	8.7	9.3	68
2.	Dimethenamid	PES	0.94	24	348	9.1	9.0	92
3.	Dimethenamid Dimethenamid	PPI PES	0.62 0.31	21	393	9.2	9.7	85
4.	Dimethenamid Atrazine	PES	0.94 1.06	23	387	9.7	9.7	95
5.	Dimethenamid Atrazine Dimethenamid Atrazine	PPI PES	1.32[1] 0.66	19	436	9.3	8.3	87
6.	Metolachlor II	PPI	1.46	19	377	8.0	8.3	58
7.	Metolachlor II	PES	1.46	20	360	8.2	8.3	67
8.	Metolachlor II Metolachlor II	PPI PES	0.96 0.48	20	398	8.7	8.7	68
9.	Metolachlor II Metolachlor II	PPI PES	1.46 1.46	20	407	8.9	8.3	75
10.	Metolachlor II Atrazine	PES PES	1.46 1.18	21	362	8.5	8.7	87
17.	Pyridate Atrazine Nicosulfuron	EPOST EPOST EPOST	0.47 0.50 0.03	19	514	10.7	10.0	88
18.	Dimethenamid Pyridate Atrazine	PES POST POST	0.94 0.47 1.00	24	385	10.0	9.3	98
19.	Pyridate Nicosulfuron	EPOST EPOST	0.47 0.03	24	395	10.3	9.7	93
20.	Metolachlor II Prosulfuron (broadcast)	PES POST	0.73 0.018	23	378	9.6	9.0	88
21.	Metolachlor II Prosulfuron (directed)	PES POST	0.73 0.018	19	450	9.2	9.0	70
26.	Nicosulfuron	EPOST	0.031	19	436	9.3	10.0	73
27.	Nicosulfuron	POST	0.031	26	304	8.5	8.3	73
28	Pyridate	EPOST	0.47					
30.	Atrazine	PES	1.18	21	372	8.7	8.7	57
31	Check	-	-	11	247	3.4	5.7	0
32.	Nicosulfuron Atrazine (gr.treatment)	POST POST	0.031 1.18	23	392	9.7	9.0	80
FPLSD(0.05)				6	79	2.4	NS	23

[1] Guardsman (dimethenamid + atrazine) rate.

Table 6. Herbicide application record.
Planting date: 6/9/96
Location: Monroe, OR

Application date	6/6/96	6/10/96	7/3/96	7/13/96
Application timing	PPI	PES	EPOST 6-8"	POST (12" corn)
Start/end time	7:45-9:15 A	10:00-12:30	9:00-10:00 A	6-8:30 A
Air temp/soil temp.(2")/surface temp.	73/68/80	71/72/-	74/77/88	75/81/80
Rel humidity %	68	50%	64%	68%
Wind direction/velocity	0	W 0-3	S 3	0
Cloud cover %	0	10	40	0
Soil moisture	dry surface	very dry	wet	excessively wet
Plant moisture	---	---	damp	very wet
Sprayer/PSI	Unicycle/40	Unicycle/40	Unicycle/40	Hand wand for directed/40 psi
Mix size	2000/ml 4 plots	2000 ml/4 plots	1000 ml	1000 ml
Gallons H_2O/acre	52/acre	52 gal/acre	25	25
Nozzle type	8003	8003	8003	8001
Nozzle spacing and height	20/18	20/18	20/18 (above corn)	20/18 (above corn) 36" spacing for directed spray
Soil inc. depth (PPI/PRE)	2"	water	-	-
Soil inc. method/implement	harrow and roll	Irrigation 0.5 inch	-	-

Weed Control in Sweet Corn, 1996

Clinton C. Shock, Mike Barnum, and Eric P. Eldredge
Malheur Experiment Station, Ontario, OR

Objectives

Preplant incorporated herbicides alone and in tank-mixes were tested for annual grass and broadleaf weed control in sweet corn.

Procedures

The herbicides evaluated in this study were Axiom 68 WG alone and in mixtures with either Atrex 4L or Bladex 4L, and, for comparison, treatments of Frontier 7.5 SL and Dual 8E. The plot area was in a field that had been in winter wheat the previous year. Following the 1995 harvest the field was plowed and cultivated, and fertilizer was broadcast at 1 00 lb P and 20 lb N per acre. The soil was Greenleaf silt loam with organic matter content 1.5% and pH 7.6. The field was planted again to winter wheat and corrugated. In May the emerged winter wheat was killed with Roundup and the existing beds were used.

On May 25, 32 plots (8 treatments x 4 replications) 1 0 by 30 ft. A mixture of weed seeds from mill screenings was broadcast uniformly with a hand-cranked spreader. Herbicide treatments were applied with a hand sprayer with a 4 nozzle boom with 8003 flat fan tips spaced 30 in., operated at 40 psi. Treatments were applied in water carrier at 20 gpa. Herbicide treatments and weed seed were immediately incorporated into the surface 2 in of the beds by harrowing 2 directions with a spike-toothed bed harrow.

On May 26, Golden Jubilee sweet corn was planted into moisture, approximately 2 in deep. Seeding rate was 30,000 seeds per acre, or 1.7 seeds per foot of row, in rows spaced 30 in apart. Rainfall from May 12 to 18 totaled 2.33 in at the site, with another 0.02 in of rain May 29. The average daily high temperature for the period May 26 to June 3 was 760F. Corn had emerged uniformly by June 3, and corn plants were visually evaluated for herbicide tolerance on June 12. The field was furrow irrigated from gated pipe to maintain adequate moisture for the corn. Herbicide effectiveness was evaluated visually on June 27. The hand weeded check plots were weeded to provide 100 percent weed control, and the untreated check plots for each replicate represented zero weed control for that replicate. On July 12, Urea fertilizer at 1 00 lb N per acre was applied dissolved in the irrigation water.

Results

One plot treated with Axiom + Atrex showed slight chlorosis on the corn when the plots were evaluated on June 12, but other than that, there were no treatments showing any symptom of phytotoxicity. Percent control was visually estimated and recorded for each weed species found in each plot (Table 1).

Herbicide treatments providing the highest percent control of redroot pigweed were Axiom + Atrex, Axiom + Bladex, and Frontier. Herbicide treatments resulting in the highest percentage control of barnyardgrass were Axiom + Atrex, Axiom + Bladex, and Dual. Yellow foxtail control was adequate with all treatments. Populations of common mallow and lambsquarters were too sporadic to detect differences in control between any of the herbicide treatments. The results suggest that Axiom, when used in combination with another herbicide, can control annual grasses and redroot pigweed, lambsquarters, and common mallow in sweet corn.

Table 1. Weed control results from preplant incorporated herbicide treatments on Golden Jubilee sweet corn. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1996.

Treatment	Herbicide	Redroot pigweed	Barnyard-grass	Yellow foxtail	Lambs-quarters	Common mallow
	lbs ai/ac	percent control				
Handweeded Check		100	100	100	100	100
Axiom 68WG + Atrex 4L	0.85 + 1.5	98	99	98	100	99
Axiom 68WG + Bladex 4L	0.85 + 3.0	95	100	100	100	97
Axiom 68WG	0.85	87	98	99	87	100
Axiom 68WG	0.94	88	98	98	88	70
Frontier 7.5SL	1.5	97	98	99	87	72
Dual 8E	3.0	88	99	99	90	68
Untreated Check	-	0	0	0	0	0
LSD (0.05)		7.3	1.6	2	19	33

Tolerance of Sweet Corn to Early Season Propane Flaming

E. Peachey and R.D.William
Horticulture Dept. OSU

Objectives

Determine tolerance of sweet corn to propane flaming at 1-3 leaf stage.

Methods

Jubilee sweet corn was planted June 4 the Vegetable research farm in 10 by 50 foot plots, on 36 inch rows, with treatments in four blocks. Propane flaming was done with a single flame dispenser was held directed above the row at approximately 12 inches above the soil. The two middle rows of each plot were flamed while the two outside border rows were not treated and were used for comparison of flame effectiveness on weed control. Cultivation was used to control weeds in the row middles. Additionally, half of each plot was kept weed free with atrazine and hand-hoeing where needed so that sweet corn tolerance to flame intensity could be measured without the interference of weeds. Sweet corn was not thinned before or after flaming. Sweet corn was harvested from the atrazine treated, weed-free half of each plot.

Discussion

Sweet corn tolerance. Early season sweet corn growth at 4 weeks after planting (WAP) was not affected when propane was applied with approximately 50 percent of the corn seedlings visible and no more than the cotyledon leaf exposed. Injury increased substantially at later flamings.

Propane applied just as the corn was emerging did not significantly reduce sweet corn yield. Sweet corn yield was reduced by the higher rates of propane. However, not all the plots were harvested because of two small areas in the field with a root rot disease that caused some corn to lodge. This greatly reduced the ability to evaluate treatment differences. Regression analysis indicated that yield was primarily a function of number of ears harvested (R^2=0.7). The most obvious aberration is treatment 4 with a high rate of propane with a yield nearly as high as the control.

Weed control. Pigweed and purslane control averaged nearly 60 and 95 percent, respectively at 4 WAP if flamed just as the corn was emerging (Trs. 1 and 2). Crop injury was <u>not</u> apparent at 4 WAP in these treatments, but flaming may have slightly reduced yield at harvest. Flaming when the corn was between one and three leaves did not improve weed control (perhaps due to the size of the weeds) but did reduce both corn growth at 4 WAP and yield, with the exception of Treatment 4.

None of treatments completely controlled weeds. However, this level of weed control at such an early stage of corn growth would greatly improve the efficiency of flaming later in the season. Propane flaming can not used if sweet corn is 2 to 10 inches tall because of risk of yield reduction, as demonstrated by research of the last two years. Weeds often establish during this period and grow beyond the stage where propane flaming can be effective. Therefore, cultivation or other practices are necessary to establish a growth differential between weeds and corn so that flaming can be used effectively after the corn is 10 inches tall. Removing the early flush of weeds as occurred in Trs. 1 and 2 without injuring corn makes propane flaming a more palpable option for weed control in sweet corn.

Table 1. Early season corn growth and weed control with propane flaming.

Corn stage	Propane rate		Growth reduction (4 WAP)	Pigweed control (4 WAP)	Purslane control (4 WAP)
	-psi-	gpa	%	%	%
1. Just emerging[1]	10	2.3	0	63	90
2. Just emerging	20	4.6	0	55	100
3. 1-2 leaf	10	2.3	25	48	83
4. 1-2 leaf	20	4.6	20	55	100
5. 2-3 leaf	10	2.3	35	55	100
6. 2-3 leaf	20	4.6	40	75	90
Anova			0.01	0.53	0.51
LSD (0.05)			22	ns	ns

Table 2. Effect of propane flaming on sweet corn yield, 1996

Corn stage	Propane rate		No. of obs.	Yield		No. ears	Average ear wt
	-psi-	-gpa-		--tons/ac--		no./5m	-g-
1. Just emerging	10	2.3	4	10.6[2]	abc	26	344 abc
2. Just emerging	20	4.6	2	10.9	abc	26	363 ab
3. 1-2 leaf	10	2.3	4	9.8	bc	25	330 c
4. 1-2 leaf	20	4.6	4	11.4	ab	29	339 bc
5. 2-3 leaf	10	2.3	3	9.3	c	24	329 c
6. 2-3 leaf	20	4.6	3	9.9	bc	26	321 c
7. No flaming	-		7	11.8	a	27	372 a
Anova (treatment)				0.01		0.25	0.003
cv				5		9	6

[1] 50% of seedlings visible at this application.
[2] Values followed by the same letter do not differ with Duncan's Multiple Range Test (0.05).

Table 3. Details of propane application. Sweet corn was planted on June 4.

	Application 1	Application 2	Application 3
Application date	June 12	June 14	June 18
Application timing	50 % of plants visible with no more than cotyledon leaf; weeds at cotyledon stage.	Corn cotyledon plus first leaf showing; weeds at cotyledon+.	Corn cotyledon plus two leaves present; pigweed at 2 leaves, purslane 3-4 leaves.
Time of application	1:00 PM	1:30 PM	1:30 PM
Air temp/soil surface temp (F)	80/98	71/77	66/87
Rel humidity (%)	60	50	50
Wind velocity (mph)	1-3	3-8	0
Cloud cover	0	0	0
Soil moister	dry	dry	damp
Plant moisture	dry	dry	wet around corn collars
Nozzle height	6”	6”	6”
Rainfall			June 17 and 3 hrs before flaming

Effect of Cover Crops and Tillage on Sweet Corn Yield and Cross-slot Planter Efficiency

E. Peachey and R. D. William
Horticulture Dept., OSU

Objectives

1. Evaluate effect of direct-seeding and cover crop residues on sweet corn yield.
2. Evaluate potential of cross-slot planter for planting sweet corn through cover crop residues.

Methods

This trial was located at the vegetable research farm. Four cover crops were planted in October, 1995 into 65 by 15 foot plots and killed with glyphosate in April of 1996 before the *Micah* barley produced seed. *Micah* barley is a spring type that emerges rapidly in the fall and often winter kills if planted before September 15. In this trial, it was partially defoliated by barley scald disease but was surviving in April. *Hesk* barley is a winter type that emerged less vigorously in the fall, had a very low growth habit and stature, and produced a low amount of residue. Triticale emerged slowly in the fall with a prostrate habit and did not show signs of winter kill (see Table 1 for seeding rates and biomass accumulation of these cover crops). However, nearly one third of the plot was under water for an extended period in February and some of the cover crops expired.

The cover crop residues were rolled before planting and one half of each plot flailed. Two fallow plots without cover crop were included in this trial. One of the fallow plots was plowed, rototilled with a vertical tine tiller, and rolled to prepare a seedbed. The other fallow treatment was left undisturbed. Sweet corn was planted with a four row cross-slot planter on June 12, 1996. Metolachlor was applied after planting at 2 lbs ai/ac. Lorsban was applied at 3 weeks after planting because of a cutworm infestation that affected plants across the field. First ears of each stalk were harvested from 16.6 feet of row in each plot.

Results and discussion

Corn yield (Table 1). At least two factors caused extreme variability in the plot; sweet corn growth was suppressed in the areas that were under water during flooding in February and cutworms damaged corn seedlings throughout the field. The cutworm damage was quantified but no obvious treatment effects were noted.

Because of the variability within treatments, corn yields did not differ statistically even though yields differed by as much as 3 t/ac. Trends indicate that flailing did not improve crop yield except for *Micah* barley, similar to last years results. However, there was a noticeable exception in the *Micah* barley plot early in the season as corn growth was much more vigorous in the unflailed plot. The upright and short stature of this spring barley and partial winter-kill removed many leaves from the cover crop and may have allowed more soil warming, therefore improving corn growth. Flailing the *Micah* barley residue decreased corn growth.

Corn emergence was very similar across treatments, however. Corn growth was most vigorous where the soil was plowed and yielded higher than all other treatments except the unflailed *Micah* barley. Average ear weight was also highest in the tilled plot. Perhaps the most useful indicator of yield is the standard error of the yield estimates (Table 2). The cover crop residue treatments typically had twice the average variation in yield as did the tilled plot.

A four row cross-slot planter was used in this trial and performed well when planting into untilled soil but in tilled soil it tended to 'plow' or push the soil in some rows because of uneven down-pressure.

The weed density at this site was relatively low and metolachlor controlled most weeds except for a few escapes in the conventional tillage plot. Weed competition was probably a very small factor in determining yields in these trial (Table 3). Triticale plus crimson clover and the *Micah* barley residue controlled weeds best. Cover crops with a legume tended to reduce this effect. There was very little crimson clover in the triticale plots because it did not survive the winter.

Table 1. Cover crop biomass accumulation.

	Cover crop	Cereal	Legume	Weeds	Total biomass	Ratio
		---------- tons dry matter/ac--------				legume/cereal
1.	Micah barley	0.9	0.0	0.0	0.9	-
2.	Micah barley & common vetch	0.5	1.0	0.0	1.5	2.45
3.	Hesk barley & common vetch	1.5	0.7	0.0	2.2	0.63
4.	Triticale & cr. clover	1.1	1.0	0.0	2.1	0.95
5.	Fallow	0.0	0.0	0.2	0.2	-
6.	Fallow plus tillage	0.0	0.0	0.1	0.1	-
	FPLSD (0.05)	0.6	0.5	0.14	0.7	1.3

Table 2. Corn yield in cover crop trial.

			Emergence	No ears harvested	Avg. ear wt	Ear yield	Std. error	Uniformity
			no./3 ft	no./16.4 ft	gr.	t/ac	t/ac	10=uniform
1.	Micah barley	flailed	10.3	16.3	407.5	7.7	2.3	8.0
		unflailed	9.0	19.3	401.3	9.0	2.3	8.3
2.	Micah barley & common vetch	flailed	12.0	15.0	419.0	7.4	1.3	7.5
		unflailed	10.8	14.8	411.0	7.2	2.6	7.8
3.	Hesk barley & common vetch	flailed	12.5	15.8	429.8	6.3	2.2	8.8
		unflailed	9.5	13.0	407.5	6.2	2.1	7.5
4.	Triticale & cr. clover	flailed	11.3	15.8	423.0	7.7	0.5	8.8
		unflailed	9.3	16.3	415.0	7.9	1.5	8.5
5.	Fallow	flailed	11.0	16.5	407.5	7.9	0.6	8.0
		unflailed	11.0	16.5	392.3	7.6	1.1	8.0
6.	Fallow plus tillage	tilled	9.8	17.1	450.7	9.0	1.1	8.6
	FPLSD(0.05)		ns	ns	ns	ns	ns	ns

Table 3. Weed control at 8 WAP in cover crop mixtures trial with metolachlor applied PES.

	Cover crop		Nightshade	Purslane	Pigweed	Barnyardgrass
			----------	%	----------	----------
1.	Micah barley	flailed	97.5	97.5	95	97.5
		unflailed	97.5	97.5	95	97.5
2.	Micah barley & common vetch	flailed	97.5	97.5	100	97.5
		unflailed	100.0	100.0	100	100
3.	Hesk barley & common vetch	flailed	97.5	97.5	95	100
		unflailed	100.0	100.0	100	97.5
4.	Triticale & cr. clover	flailed	100.0	100.0	100	100
		unflailed	100.0	100.0	100	100
5.	Fallow	flailed	100.0	75.0	100	100
		unflailed	97.5	92.5	97.5	100
6.	Fallow plus tillage	tilled	87.5	87.5	100	87.5
	FPLSD (0.05)		6	ns	ns	7

Impact of Cover Crops, Tillage, and Herbicides on Weed Control in Sweet Corn

R. Ed Peachey and R.D.William
Horticulture Dept., OSU

Objectives

Determine cover crop residue effects on weed suppression with and without preemergence herbicides.

Methods

This trial was located at the vegetable research farm to assess impact of cover crops, direct seeding, and tillage on weeds, and weed control with dimethenamid and metolachlor. Four cover crops were planted in October, 1995 into 65 by 15 foot plots and killed with glyphosate in April of 1996 before the *Micah* barley produced seed. *Micah* barley is a spring type that emerges rapidly in the fall and often winter kills if planted before September 1. In this trial, it was partially defoliated by barley scald disease but was surviving in April. *Hesk* barley is a winter type that emerged less vigorously in the fall, had a very low growth habit and stature, and produced a low amount of residue. Triticale emerged slowly in the fall with a prostrate habit and did not show signs of winter kill (see Figure 1 for seeding rates and biomass accumulation of these cover crops). However, nearly one third of the plot was under water for an extended period in February and some of the cover crops expired.

The cover crop residues were rolled before planting and one half of each plot flailed. Two fallow plots without cover crop were included in this trial. One of the fallow plots was plowed, rototilled with a vertical tine tiller, and rolled to prepare a seedbed. The other fallow treatment was left undisturbed. Sweet corn was planted with a four row cross-slot planter on June 12, 1996.

Dimethenamid and metolachlor were broadcast PES perpendicular to and across each block in 30 foot strips. One 15 foot wide strip was not treated with herbicide. Lorsban was applied at 3 weeks after planting because of a cutworm infestation that affected plants across the field.

Results and discussion

Cover crop residues left undisturbed on the soil surface suppressed weeds from 70 to 90 percent (without preemergence herbicides) compared to the conventionally tilled plot. Simply eliminating tillage in the spring suppressed weeds as effectively as plots that also had cover crop residues. Purslane and barnyardgrass were suppressed most at 8 WAP (Table 1).

Herbicides greatly improved weed control but only in the conventionally tilled plots (fallow + tillage). Nightshade was least affected by metolachlor. Dimethenamid improved weed control slightly compared to metolachor (Tables 2 and 3).

Injury to corn from dimethenamid was greater than from metolachlor, particularly in cover crop residue treatments (data not presented). The cause for this is unknown, but may have been related to seed depth at planting. Corn seed may have been planted slightly shallower in the cover crop residue plots.

Table 1. Cover crop and tillage effects on weed control in sweet corn with the **no herbicide**, Corvallis, Or, 1996.

	Cover crop	Management	Pigweed	Nightshade	Purselane	Barnyardgrass
				---------- %----------		
1	Micah barley	flailed	80	98	100	100
1	Micah barley	unflailed	95	95	100	100
2	Micah barley & common vetch	flailed	89	85	80	100
2	Micah barley & common vetch	unflailed	70	75	88	88
3	Triticale & cr. clover	flailed	70	91	100	100
3	Triticale & cr. clover	unflailed	86	93	90	100
4	Hesk barley & c. vetch	flailed	80	88	100	100
4	Hesk barley & c. vetch	unflailed	83	95	98	100
5	Fallow	flailed	80	68	88	78
5	Fallow	unflailed	78	78	78	70
6	Fallow	tilled	0	0	0	0
6	Fallow	tilled	0	0	0	0
	LSD (0.05)		31	20	24	22

Table 2. Cover crop and tillage effects on weed control in sweet corn with the herbicide **metolachlor**, Corvallis, Or, 1996

	Cover crop	Management	Pigweed	Nightshade	Purselane	Barnyardgrass
				---------- %----------		
1	Micah barley	flailed	95	98	98	98
1	Micah barley	unflailed	95	98	98	98
2	Micah barley & common vetch	flailed	100	98	98	98
2	Micah barley & common vetch	unflailed	100	100	100	100
3	Triticale & cr. clover	flailed	100	100	100	100
3	Triticale & cr. clover	unflailed	100	100	100	100
4	Hesk barley & c. vetch	flailed	95	98	98	100
4	Hesk barley & c. vetch	unflailed	100	100	100	98
5	Fallow	flailed	100	100	75	100
5	Fallow	unflailed	98	98	93	100
6	Fallow	tilled	100	88	88	88
6	Fallow	tilled	100	88	88	88
	LSD (0.05)		ns	6	ns	7

Table 3. Cover crop and tillage effects on weed control in sweet corn with the herbicide **dimethenamid**, Corvallis, Or, 1996

	Cover crop	Management	Pigweed	Nightshade	Purselane	Barnyardgrass
				---------- % ----------		
1	Micah barley	flailed	100	100	100	100
1	Micah barley	unflailed	100	100	100	100
2	Micah barley & common vetch	flailed	100	98	100	100
2	Micah barley & common vetch	unflailed	100	100	100	100
3	Triticale & cr. clover	flailed	100	100	100	100
3	Triticale & cr. clover	unflailed	100	100	100	100
4	Hesk barley & c. vetch	flailed	98	98	100	100
4	Hesk barley & c. vetch	unflailed	100	100	100	100
5	Fallow	flailed	100	100	100	100
5	Fallow	unflailed	100	100	100	100
6	Fallow	tilled	100	100	99	100
6	Fallow	tilled	100	100	100	100
	LSD (0.05)		ns	ns	ns	ns

Weed Control and Squash Tolerance to Herbicides

R. Ed Peachey and R. D. William
Department of Horticulture, OSU

Introduction

Weed control with herbicides in squash and cucurbits has deteriorated because of loss of Amiben while other herbicides provide marginal control. Ethafluralin controls weeds, but growers are reluctant to use it because of occasional injury under excessive moisture. Clomazone may be registered soon on cucumbers but concerns about off-site movement, residuals remaining to the next season, and poor control of pigweed may limit use. Two new options for broadleaf weed control in squash are halosulfuron and sulfentrazone. Halosulfuron is a pre and postemergence sulfonylurea herbicide for broadleaf weed control. Sulfentrazone is a preemergence herbicide with chemistry similar to metribuzin. Both herbicides may have potential in row crop systems depending on weed spectrum and herbicide carryover.

Methods

Squash var. Golden delicious was planted on June 1, 1996 in finely tilled sandy loam soil at the vegetable research farm near Corvallis, OR. Fertilizer (480 lbs/ac of 12-29-10) was banded next to the row at planting. Two 30 inch rows were planted in each 15 foot wide by 30 foot plot. There were three replications in a randomized complete block design.

Herbicides were applied preemergence surface on June 3 to dry soil and irrigation applied within one hour. The postemergence treatments were applied on June 20, 3 WAP to squash that had 2-4 true leaves. Emerged weeds were counted at 4 WAP from 4 ft^2 quadrats in each plot.

Squash biomass was cut from one row in each plot (biomass row) at 6 WAP. This row was cultivated at 4 WAP but not hand-weeded or thinned. Weed control was estimated visually after the biomass cut was taken. Weeds and squash plants were then removed from the entire biomass row.

The second row of each plot (yield row) was cultivated and hoed to remove weeds at 4 WAP, thinned to approximately equal stands, and kept weed free un-till harvest. Squash was harvested from 27 ft of each plot on September 20. Each fruit was weighed individually which allowed assessment of variability of fruit weight within each plot.

Results and discussion

Emergence and growth. Squash emergence may have been reduced slightly by halosulfuron PES compared to the treatment without herbicides (Table 1). Plant growth was seriously affected by halosulfuron POST. A slight growth reduction also was with halosulfuron PES and FOE 5043 but a portion of this reduction was probably due to nightshade competition. Both compounds were completely ineffective at controlling hairy nightshade, the predominant weed at this site.

Sulfentrazone, clomazone, and dimethenamid showed no reduction in plant growth at 5 WAP. The crop biomass cut at 6 WAP indicated that sulfentrazone treatments had the highest total biomass per plot and average plant weight. Dimethenamid may have reduced total plant biomass and average plant weight slightly. The 2X rates of halosulfuron PES and POST significantly reduced plant biomass and average plant weight. Even though the acetochlor treatment showed little visual reduction in growth, plant biomass was nearly 2 kg lower than the sulfentrazone treatment. The untreated check indicated that at least some of the plant growth reduction was due to weed competition even though the plots were cultivated at 4 WAP. Weed competition was probably the cause of reduced biomass in the FOE 5043 treatment.

Squash yield. Three of the treatments had little effect on nightshade, and despite frequent weed removal, it was obvious that weed competition and injury during weed removal were reducing squash growth. Therefore, only squash yield for the 2X rates are reported for these treatments (included both halosulfuron treatments and FOE 5043). A weed control rating is included in Table 2 to help interpret the yield trends. Weed escapes (mostly nightshade) may have contributed to yield loss in some cases.

Squash yield was low overall compared to acceptable yields in the Willamette Valley but due to the wide row spacing used in this trial to facilitate harvest. The planting date also was delayed because of late rains. Squash yield was greatest in the sulfentrazone treatment at 19.4 tons/ac (Table 2, Figure 1). The 2X rate of sulfentrazone reduced yield by 3 tons, but this yield was still greater than or nearly equal to all of the other treatments. The reason for the reduced yield in the 2X treatment was probably because of the fewer fruit that were harvested; average fruit weight in this treatment was greater than or equal to all other treatments except sulfentrazone at the 1X rate.

The 2X rate of dimethenamid significantly reduced both fruit weight and yield. However, yield of the untreated, weeded check indicates that at least part of the yield reduction may have been due to weed competition and weed removal. An overall weed control rating was included at harvest to assist interpretation of data. Hairy nightshade was the primary weed surviving at harvest.

Differences in fruit quality were very obvious at harvest, but only in the clomazone treatments. The squash fruit in both clomazone treatments had a washed-out appearance on the outside and poor color development on the inside. The squash seeds also seemed to be less developed than in other treatments. Variability in fruit weight between treatments was evident and was highest for dimethenamid and sulfentrazone.

Horticultural Weed Control

1996 Report

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The Report

Results from vegetation management trials involving horticultural crops conducted during the past year are compiled and reported by faculty members of the Oregon Agricultural Experiment Station, the Oregon State Extension Service, and colleagues who cooperated from adjacent states. This work was conducted throughout Oregon and involved many individuals. This work has expanded beyond conventional herbicide technology and includes research on the impacts of cover crop vegetation management on weed control, techniques such as propane flaming for selective weed control, and the effects of vegetation management strategies on other pests such as symphylans.

The contributors sincerely appreciate the cooperative efforts of the many growers, university employees, and local representatives of the production and agrochemical industries. We also gratefully acknowledge financial assistance from individual growers, grower organizations, and companies which contributed to this work.

Information and Evaluation

Crops were grown at the experimental farms using accepted cultural practices (within the limits of experimentation) or trials were conducted on growers' fields. Most experiments were designed as randomized complete blocks with three to five replications. Herbicide treatments were applied uniformly with precision plot sprays. Unless otherwise indicated, preplant herbicide applications were incorporated with a PTO horizontal rotary tiller operated at a depth of approximately two inches. After critical application stages, crops were irrigated with overhead sprinklers at weekly intervals or as needed.

Crop and weed responses are primarily visual evaluations of stand reduction (SR) and growth reduction (GR), ranging from 0-100 with 100 as the maximum response for each rating, or an over-all rating of 0-10 for crop response or control of specific weed species with 10 being complete control of the weed or good crop vigor (no injury). Additional data such as crop yields are reported for certain studies and may be reported in either English or metric systems.

Abbreviations

DAP	Days after planting
WBP	Weeks before planting
WAP	Weeks after planting
PRE/PES	Preemergence herbicide application/preemergence surface
PPI	Preplant incorporated herbicide application
PPS	Preplant surface
POSTB	Postemergence broadcast herbicide application
POSTD	Postemergence directed herbicide application
ai/ac	Active ingredient per acre

HERBICIDES TESTED

Common Name	Manufacturer	Trade Name	Page Number
Acetochlor	Monsanto	Harness	45, 53, 63, 85, 93
Alachlor	Monsanto	Lasso	107
Atrazine	Ciba Crop Proection	Aatrex	45, 53, 63, 71, 73
Bensulide	Gowan	Prefar	41
Bentazon	BASF	Basagran	1, 9, 15, 23, 63
Bromoxynil	Rhone-Poulenc	Buctril	97
Clomazone	FMC Corp	Command	1, 9, 15, 25, 41, 85, 93, 111
Cyanazine	Du Pont	Bladex	71
Dimethenamid	Sandoz	Frontier	1, 9, 15, 25, 45, 53, 63, 71, 81, 85, 93, 117
Diuron	Du Pont	Karmex	103, 111
EPTC	Zeneca	Eptam, Eradicane	1, 9, 15, 25, 45, 53, 63, 99
FOE 5043	Bayer	Experimental	9, 85, 93
Ethalfluralin	Dow Elanco	Curbit	41, 85, 88, 93
Glyphosate	Monsanto	Roundup	77, 81, 115, 119, 127
Halosulfuron	Monsanto	Battalion	45, 63, 85, 93
Lactofen	Valent	Cobra	1, 5, 9, 15, 25
Linuron	Du Pont	Lorox	97, 99, 103, 105
Metam sodium	Zeneca	Vapam	141
Metolachlor	Ciba Crop Proection	Dual	1, 5, 9, 15, 25, 45, 53, 63, 71, 77, 81, 109
Metribuzin	Bayer, Du Pont	Sencor, Lexone	97, 103
Metribuzin + FOE 5043	Bayer	Axiom	45, 53, 63, 71
Naptalam	Uniroyal	Alanap	41
Nicosulfuron	Du Pont	Accent	45, 53, 63, 71
Oryzalin	Dow Elanco	Surflan	111
Oxyfluorfen	Rohm and Haas	Goal	31, 37, 111
Pendimethalin	American Cyanamid	Prowl	97, 99, 107
Prometryn	Ciba Crop Protection	Caparol	97, 105, 111
Pronamide	Rohm and Haas	Kerb	111
Propachlor	Monsanto	Ramrod	107
Prosulfuron	Ciba Crop Protection	Peak (proposed)	45, 63
Pyridate	Sandoz	Tough	37, 45, 63
Sulfentrazone	FMC	Authority	1, 9, 85, 93
Trifluralin	Dow Elanco	Treflan	1, 5, 8, 15, 22, 109

COVER CROPS USED IN TRIALS

Common vetch	77, 81
Crimson clover	77, 81
Hesk barley	77, 81
Martiginia white mustard	119
Micah barley	77, 81, 119, 127
Monida oats	77, 81, 119, 127
Steptoe barley	77, 81
Triticale	77, 81
Wheeler cereal rye	119, 127

Table 1. Temperature and precipitation at Hyslop Research Farm, Corvallis, OR, 1996.

	April				May				June				July			
Day	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)
1	55	46	1	0.46	72	46	9	0.01	72	51	12		82	50	16	
2	61	44	3	T	64	45	5		80	52	16		86	54	20	
3	55	35	0	0.04	58	33	0	0.02	86	54	20		84	54	19	
4	62	36	0		53	31	0	0.11	80	47	14		79	52	16	
5	71	43	7		60	32	0		70	49	10		73	48	11	
6	75	44	10		65	39	2		76	46	11		77	50	14	
7	78	49	14		66	36	1	T	84	49	17		85	55	20	
8	79	46	13		58	30	0	0.06	73	47	10		93	56	25	
9	71	49	10	T	60	34	0		72	43	8		87	54	21	
10	63	44	4	0.02	61	41	1		67	41	4		75	48	12	
11	54	46	0	0.02	62	45	4		73	47	10		82	48	15	
12	52	41	0	0.74	68	52	10	0.01	71	46	9		90	55	23	
13	52	37	0	0.17	67	56	12	0.40	78	45	12		96	58	27	
14	62	41	2		66	54	10	0.26	73	43	8		99	60	30	
15	71	46	9		66	52	9	0.24	75	43	9		99	54	27	
16	65	44	5	0.19	66	46	6	0.10	73	43	8		85	45	15	
17	55	39	0	0.12	67	51	9	0.62	67	38	3		50	55	18	0.20
18	53	37	0	0.10	62	50	6	0.56	63	44	4	0.09	62	51	7	0.67
19	53	40	0	0.14	60	44	2	0.73	68	49	9	0.01	68	51	10	0.05
20	52	41	0	0.30	62	39	1	0.03	79	46	13		75	49	12	
21	55	42	0	0.27	65	43	4	0.30	76	42	9		78	58	18	
22	58		1	0.46	55	44	0	0.27	70	44	7		81	58	20	
23	57	49	3	0.70	59	45	2	0.14	75	52	14	0.38	94	62	28	
24	60	44	2	1.09	61	44	3	0.01	67	53	10	0.28	97	59	28	
25	61	46	4	0.03	71	46	9		68	52	10	0.01	95	56	26	
26	62	36	0	0.05	79	46	13		73	45	9		95	57	26	
27	61	38	0	0.03	68	38	3		80	54	17	T	97	59	28	
28	60	40	0		61	40	1		69	55	12	0.08	92	58	25	
29	67	43	5		61	46	4	0.06	71	46	9		83	58	21	T
30	71	44	8		62	47	5	0.05			10		91	57	24	
31					64	40	2						86	50	18	
Total			96	4.93			128	3.98			307	0.85			613	0.92

Table 1 Cont'd

	August				September				October				November			
	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)	Max T	Min T	Deg days (at 50F)	Precip (in)
1	84	48	16		77	49	13		74	51	13		58	31	0	
2	79	53	16	0.14	78	49	14		72	43	8		58	34	0	
3	71	52	12	T	75	46	11		74	49	12		52	37	0	
4	76	50	13		76	42	9		78	50	14		58	39	0	0.10
5	73	53	13		68	41	5	0.13	75	54	15	0.39	53	35	0	0.10
6	75	51	13		71	43	7		65	43	4		53	38	0	
7	81	55	18		78	45	12		71	47	0		54	40	0	0.25
8	92	54	23		83	48	16		81	49	15		55	39	0	
9	94	55	25		82	56	19		77	49	13		58	39	0	
10	97	56	27		78	50	14		82	52	17		47	40	0	
11	100	55	28		86	51	19		66	52	9	T	47	40	0	
12	76	53	15		83	54	19		66	43	5	T	55	41	0	
13	86	55	21		69	53	11		61	48	5	0.64	62	41	2	0.29
14	94	51	23		69	55	12	0.23	62	42	2	0.13	57	44	1	0.13
15	89	51	20		63	50	7	1.26	56	44	0	0.32	57	41	0	0.10
16	86	50	18		64	49	7	0.39	59	39	0	0.28	52	43	0	0.25
17	84	47	16		63	50	7	0.07	51	35	0	T	50	44	0	0.62
18	75	40	8		67	42	5		56	37	0	0.46	51	42	0	0.63
19	72	46	9		67	45	6	0.08	51	38	0	0.66	46	34	0	4.45
20	77	52	15		67	46	7		54	39	0	0.06	58	33	0	0.50
21	78	50	14		67	41	4		56	34	0		51	37	0	0.03
22	82	53	18		66	40	3	0.06	55	38	0	0.23	41	38	0	0.80
23	90	53	22		64	45	5		57	40	0	T	44	31	0	
24	93	61	27		72	40	6		56	43	0	0.76	50	35	0	0.51
25	93	61	27		71	43	7		60	44	2	0.87	59	37	0	0.25
26	83	58	21	T	74	48	11		56	32	0	0.05	50	39	0	0.02
27	74	55	15	T	79	45	12		51	33	0		50	40	0	0.29
28	76	49	13		83	47	15		56	38	0		55	45	0	0.59
29	85	52	19		84	46	15		50	38	0	0.47	52	37	0	0.12
30	92	56	24		78	52	15		52	35	0		48	38	0	0.02
31	82	48	15						61	41	1					
Total			556	0.14			307	2.22			141	5.32			2	10.20

Table 2. Temperature and precipitation at Salem, OR, 1996.

Day	May Max T	May Min T	May Precip	June Max T	June Min T	June Precip
1	62	46	0	80	50	0
2	55	36	0.08	87	53	0
3	52	36	0.05	78	51	0
4	60	32	0	69	50	0
5	65	36	0	77	50	0
6	64	36	0	84	48	0
7	57	35	0.03	73	52	0
8	59	31	0	72	49	0
9	60	34	0	68	49	T
10	62	42	0	74	43	0
11	65	46	T	71	47	0
12	66	52	0.23	79	43	0
13	64	55	0.06	73	47	0
14	65	54	0.03	75	45	0
15	65	52	0.04	72	43	0
16	66	47	0	68	45	0
17	62	51	0.82	62	42	0.04
18	62	48	0.43	68	45	T
19	62	44	0.01	80	47	0
20	64	40	0	76	46	0
21	56	48	0.81	69	47	0
22	59	45	0.38	71	47	0.18
23	59	47	0.11	69	53	0.21
24	72	44	0	65	52	0.31
25	78	46	0	73	51	0
26	67	49	0	78	47	0
27	63	39	0	69	56	T
28	60	46	T	68	53	0
29	60	47	0.1	77	46	0
30	63	45	T	82	48	0
31	70	41	0			
Total			3.18			0.74

Day	July Max T	July Min T	July Precip	August Max T	August Min T	August Precip
1	86	51	0	79	49	0
2	83	56	0	71	55	0.2
3	79	54	0.02	74	54	0
4	72	52	0	73	52	T
5	77	42	0	73	55	0
6	86	52	0	81	47	0
7	94	54	0	94	53	0
8	86	56	0	95	57	0
9	76	55	0	97	55	0
10	82	49	0	99	58	0
11	90	53	0	75	51	0
12	96	57	0	87	54	0
13	99	60	0	92	56	0
14	98	62	0	88	57	0
15	85	56	0	85	49	0
16	78	50	0	82	52	0
17	59	54	0.69	74	46	T
18	67	52	0.16	70	45	0
19	73	55	0	77	45	0
20	76	52	0	76	54	0
21	82	58	0	83	49	0
22	96	59	0	92	51	0
23	98	62	0	95	52	0
24	95	62	0	94	58	0
25	95	56	0	81	61	0
26	95	59	0	72	60	T
27	92	60	0	73	55	0
28	80	62	0.03	83	50	0
29	91	59	0	91	54	0
30	85	58	0	80	56	T
31	83	52	0	77	50	0
Total			0.90			0.20

Day	September Max T	September Min T	September Precip
1	78	47	0
2	73	46	0
3	75	48	0
4	66	46	0.1
5	69	45	0.01
6	74	45	0
7	81	48	0
8	81	50	0
9	78	55	0
10	85	48	0
11	82	53	0
12	66	54	0
13	66	56	0.03
14	61	56	0.95
15	66	50	0.52
16	64	50	0.23
17	66	48	0.01
18	66	43	0.04
19	68	51	0.02
20	66	45	0
21	65	41	0.04
22	64	42	0
23	73	41	0
24	72	41	0
25	74	39	0
26	79	45	0
27	82	46	0
28	82	49	0
29	78	47	0
30	70	52	0.01
31			
Total			1.96

Snap Bean Tolerance to Herbicides

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Objectives

Quantify snap bean tolerance to metolachlor, dimethenamid, and lactofen.

Methods

Snap beans were planted at the Vegetable Research Farm near Corvallis on June 7 and at a site near Lebanon on May 30, 1996 in 12 by 30 ft plots, with three replications. At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows, and PES herbicides were incorporated with 0.5 inches of irrigation 3 days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and snap beans planted on 24 inch rows (May 30). Three plots were added on one side of the trial to include the grower applied treatment of EPTC and lactofen. This treatment differed from the others in that ethoprop and EPTC were incorporated together. Ethoprop was not applied to the other treatments. Irrigation was not applied until nearly one week later, just as the beans were emerging. This may have aggravated lactofen injury on the beans as reported in Table 2.

A single between-row cultivation was used to reduce weed competition. Hand hoeing and pulling was not used because of potential negative impact on crop growth. The weed level at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis the general level was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

Snap beans were harvested from 6.6 ft or row at both sites and biomass weighed and plants counted. Snap bean pod yield was determined only at Corvallis, and pods collected from the replications of each treatment were combined and graded.

Results and Discussion

Corvallis (Table 1). Dimethenamid PPI injured snap beans more than when applied PES and more than metolachlor at 3 WAP. Snapbean yield was probably more a factor of weed control than tolerance to herbicides, however. Cultivation was used to control weeds in row middles but poor weed control with metolachlor (PPI) may have decreased yields. It is unclear why EPTC plus lactofen yielded nearly 1 ton less than the treatment with the highest yield of 11.1 tons/ac (metolachlor + EPTC + trifluralin). It is unlikely that weed competition decreased yield; weed control was nearly 100 percent at harvest in both treatments.

Lebanon (Table 2). Snap bean biomass may have been slightly reduced by dimethenamid PPI, and lactofen plus metolachlor PES. The EPTC treatment reduced biomass yield, and was probably not totally related to weed competition. Other treatments with much higher weed levels had higher yields. Of particular concern was the lactofen plus EPTC application that gave exceptional weed control but also had the lowest biomass yield. This treatment was applied by the grower and differed from the other treatments in that ethoprop was applied PPI with the EPTC.

Table 1. Herbicide impacts on snap bean yield, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Crop growth		At snap bean harvest				
			Emergence 6/21	Injury 7/5	Bean plants	Bean plant biomass	Pod yield	Grade	Total weed rating[1]
		lbs ai/ac	no./3 ft row	%	No./6.6' row	t/ac	t/ac	% 2-4	0= complete weed control
1. Dimethenamid	PPI	1.25	21	13	44	21.0	10.7	43	4
2. Dimethenamid	PES	1.25	24	5	41	20.2	10.2	44	2
3. Dimethenamid	PPI	2.50	20	10	36	18.2	10.6	51	-
4. Dimethenamid	PES	2.50	22	2	37	18.1	10.1	47	-
5. Metolachlor	PPI	2.00	21	3	36	16.6	9.6	42	10
6. Metolachlor	PES	2.00	25	0	39	19.7	8.9	44	13
7. Metolachlor	PPI	4.00	24	4	40	17.7	10.3	48	-
8. Metolachlor	PES	4.00	23	0	42	19.1	10.3	46	-
9. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.5 1.0	30	5	47	21.9	11.3	43	1
10. EPTC	PPI	3.50	26	0	41	21.9	9.1	45	14
11. Lactofen	PES	0.125	25	3	42	19.1	10.2	54	3
12. Lactofen	PES	0.188	20	2	40	16.6	10.1	46	6
13. Dimethenamid Lactofen	PES PES	1.20 0.125	23	0	49	19.5	10.7	46	0
14. Dimethenamid Lactofen	PES PES	0.75 0.188	25	2	44	19.4	11.0	43	0
15. Metolachlor Lactofen	PES PES	2.00 0.125	22	0	42	20.8	10.5	44	4
16. Metolachlor Lactofen	PES PES	1.0 0.188	25	7	44	19.7	10.7	50	0
17. EPTC Lactofen	PPI PES	3.5 0.188	26	2	49	15.9	10.1	47	1
18. Bentazon	EPOST	1.0	24	-	41	16.1	8.6	50	26
19. Clomazone	PES	0.5	26	2	45	20.0	8.6	53	8
20. No herbicide, one cultivation	-	-	22	0	43	15.3	6.4	61	30
21. No herbicide, two cultivations	-	-	24	0	43	15.4	7.9	52	-
FPLSD(0.05)			ns	7	ns	4.7	2.7	-	16

[1] Rating based on growth stage of weeds (rating of 3 ≅ 1 seed producing plant/ 6.6 ft of row). Data for 2X rates is not available but would ≅ 0.

Table 2. Tolerance of snap beans to herbicides, Lebanon, OR ,1996

	Herbicide	Timing	Rate	Emergence	Seedling injury rating[1]	Plants harvested	Biomass	Total weed rating[2]
			lbs ai/ac	no/m of row	10=all 0=none	no/2 m	t/ac	0= no weeds
1.	Dimethenamid	PPI	1.25	20	0	43	18.8	0.3
2.	Dimethenamid	PES	1.25	20	0	44	20.0	0
3.	Metolachlor	PPI	2.00	22	1	41	21.1	2.0
4.	Metolachlor	PES	2.00	23	0	45	21.1	1.3
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	20	1	48	22.1	0
6.	EPTC	PPI	3.50	21	0	42	16.0	1.0
7.	Lactofen	PES	0.125	22	2	53	20.0	0
8.	Lactofen	PES	0.188	23	1	44	20.3	0.7
9.	Metolachlor Lactofen	PES PES	2.00 0.13	20	3	45	18.5	4.5
10.	Metolachlor Lactofen	PES PES	1.00 0.188	20	2	35	19.0	0.0
11.	EPTC Lactofen (grower tr.)	PPI PES	2.8 0.188	na	3	44	14.8	2.3
12	EPTC Lactofen	PPI PES	3.5 0.188	22	1	53	18.0	0
13.	Clomazone (ME)	PES	0.50	20	0	44	20.3	6.6
14.	Bentazon	EPOST	1.00	22	-	44	20.7	1.9
15.	Two cultivations, no herbicide	-	-	21	0	46	20.8	7.4
16.	Check:uncultivated, no herbicide	-	-	22	0	45	16.9	11.3
	FPLSD (0.05)			ns	1.6	ns	1.5	4.8

[1] This rating reflects plant deformation (herbicide symptoms) rather than biomass reduction. In the lactofen treatments, the first true leaves had a spinach-like appearance. A rating of 10 = all seedlings showing injury, 0= none.
[2] Rating based on growth stage of weeds (rating of 3 = 1 seed producing plant/ 6.6 ft of row).

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96	7-1-96
Application timing	PPI	PES	POST
Start/end time	1:00 - 2:00	6:00 - 8:30	7:00 - 8:00
Air temp/soil temp (2")/surface	86/88/94		69/68/72
Rel humidity	50%	60%	60%
Wind direction/velocity	NW (1-5)	0	0
Cloud cover	0	70	0
Soil moisture	Dry	Dry	Dry
Plant moisture	-	-	Dew
Sprayer/PSI	Uni /40	Uni/40	40
Mix size	2000/ 3 plots	2000/ 3 plots	1400/ 3 plots
Gallons H_2O/acre	20	20	25
Nozzle type	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18
Soil inc depth (PPI/PRE)	2"		
Soil inc method/implement	Rotara & roller	0.5 " irrigation	

Table 4. Herbicide application data sheet, Lebanon, OR 1996

Application date	5-30-96	5-31-96	6-1-96	6-21-96
Application timing	PPI	PES	PES 2 (Trs 11 and 12)	POST
Start/end time	10:50-11:30	10:00 11:00	10:30 - 10:45	1st tri expanded 7:30-8:00
Air temp/soil temp (2")/surface	62.3/58.2	70.5/66.5	72/70/82	58/65/64
Rel humidity	40%	62%	70%	70%
Wind direction/velocity	NW 3.25 mph	2 SW	0-2 S	0
Cloud cover	50%	50%	0	100
Soil moisture	Dry Surface	Dry	Dry	Dry
Plant moisture	-	-	-	Dew (light)
Sprayer/PSI	Uni/40	Uni 40	Uni 40	40
Mix size	2 liters/3 plots	2 liters/3 plots	2 liters/3 plots	2/liter/3 plots
Gallons H_2O/acre	30	30	30	30
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	19/18	19/18	19/18	19/17
Soil inc depth (PPI/PRE)	2"	-	-	
Soil inc method/implement	rototiller	irrigation 0.5 " approx.	-	

Snap Bean Response to Rates of Metolachlor and Lactofen

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Objective

This trial was initially conceived to determine most cost effective use of metolachlor and lactofen for broadleaf and grass weed control in snap beans. However, broadleaf weed emergence was very low in the entire field. While weed control was difficult to evaluate, the extended period of rain after planting gave an opportunity to evaluate snap bean tolerance to combinations of these two herbicides.

Methods

Snap beans (OR 91G) were planted on May 11, 1996 on 15 inch rows on a silt loam soil with pH 5.6 , 6.2 % OM and CEC of 24.6 meq/100 g of soil. Herbicides were applied on May 13 to wet soil in 10 by 25 foot plots with 3 replications. A rainy period followed application with approximately 4 inches of rain in the first four weeks after planting. Emerged weeds were counted 4 WAP from 1 m^2 area in each plot. Emergence and the number of snap bean seedlings that had one fully expanded trifoliate were counted from six linear ft of row per plot. Snap bean biomass was harvested from a one m sq area in each plot. The grower applied quizalafop to the entire field, including the trial area to control annual ryegrass. Damage due to quizalafop was moderate shortly after application, and may have slightly depressed snap bean yield.

Results and Discussion

Treatments in the tables are arranged from low to highest rates of lactofen within increasing metolachlor rates. Crop injury and emergence at 4 WAP were highly variable within treatments (Table 1). Trends in crop injury were evident with the highest rate of metolachlor and lactofen. Injury increased within each set of metolachlor rates as the lactofen rate increased. Counting plants that had reached full expansion of the first trifoliate 4 WAP indicated lactofen also was slowing development. Snap bean biomass decreased steadily from 4.0 to 2.7 kgs/m^2 as the metolachlor and lactofen rates increased (Table 3).

Broadleaf weed emergence was very low (Table 2). Chickweed was the primary weed and was controlled by only the high rate of metolachlor and lactofen. Treatments 4 and 6 were the only treatments that improved total broadleaf weed compared to the untreated check.

Considering the weeds present, weed density at this site, and the inclement weather conditions during the initial four weeks of growth, the best overall treatment was metolachlor plus lactofen at 1.0 and 0.125 lbs ai/ac respectively. Though weed control was not exceptional with this treatment, it minimized both crop injury and crop yield loss due to weed competition. The data also indicate that metolachlor plus lactofen at 1.5 and 0.125 lbs ai/ac respectively could be used if more complete weed control were desired, but with a slight risk of yield loss.

Table 1. Snap bean and weed response to combinations of metolachlor and lactofen on June 10, 4 WAP, Albany OR, 1996

Herbicide	Rate		Crop injury	Emergence	Trifoliate stage	Annual ryegrass control
	pts or oz/ac	lbs ai/ac	%	no./3 ft	no/3 ft	%
1. Metolachlor	1 pt	1.00	7	15	12	40
Lactofen	8 oz	0.125				
2. Metolachlor	1 pt	1.00	10	12	10	33
Lactofen	12 oz	0.188				
3. Metolachlor	1.5 pt	1.50	0	14	12	37
Lactofen	4 oz	0.063				
4. Metolachlor II	1.5 pts	1.50	7	13	10	57
Lactofen	8 oz	0.125				
5. Metolachlor	2 pt	2.00	7	15	12	57
Lactofen	4 oz	0.063				
6. Metolachlor	2 pts	2.00	17	11	8	52
Lactofen	12 oz	0.188				
FPLSD (0.10)			ns	ns	3	28

Table 2. Weed survival on June 27, 6 WAP in snap beans, Albany, OR 1996.

Herbicide	Rate		Groundsel	Chickweed	Knotweed	Misc.	Total
	pts. or oz/ac	lb ai/A	--- no. /m sq ---				
1. Metolachlor	1 pt	1.000	0.0	3.3	0.0	0.0	3.3
Lactofen	8 oz	0.125					
2. Metolachlor	1 pt	1.00	0.0	5.0	0.0	1.0	6.0
Lactofen	12 oz	0.188					
3. Metolachlor	1.5 pt	1.500	0.0	2.3	0.0	1.3	3.7
Lactofen	4 oz	0.063					
4. Metolachlor	1.5 pts	1.500	0.0	1.3	0.0	0.0	1.3
Lactofen	8 oz	0.125					
5. Metolachlor	2 pt	2.000	0.3	1.7	0.7	1.0	3.7
Lactofen	4 oz	0.063					
6. Metolachlor	2 pts	2.000	0.0	0.3	0.0	0.3	0.7
Lactofen	12 oz	0.188					
7. Metolachlor	1.5 pts	1.500	0.0	2.0	0.0	0.5	2.5
Lactofen (growers' tr.)	8 oz	0.125					
8. Check			0.5	3.5	0.0	0.8	4.8
FPLSD (0.05)			ns	2.9	ns	ns	2.8

Table 3. Snap bean biomass yield and weed control at harvest (July 22), Albany OR, 1996.

Herbicide	Rate		Biomass harvested	No. plants harvested	Avg. plant wt	Weed control estimate
	pts or oz	lbs ai/ac	kg/m sq	no/3 ft	gr.	%
1. Metolachlor	1 pt	1.00	4.0	38	109	70
Lactofen	8 oz	0.125				
2. Metolachlor	1 pt	1.00	3.8	36	111	73
Lactofen	12 oz	0.188				
3. Metolachlor	1.5 pt	1.500	3.8	33	122	70
Lactofen	4 oz	0.063				
4. Metolachlor	1.5 pts	1.500	3.6	32	112	90
Lactofen	8 oz	0.125				
5. Metolachlor	2 pt	2.000	2.9	35	84	90
Lactofen	4 oz	0.063				
6. Metolachlor	2 pts	2.000	2.7	29	91	77
Lactofen	12 oz	0.188				
7. Metolachlor II	1.5 pts	1.500	3.6	30	94	90
Lactofen (growers treatment)	8 oz	0.125				
8. Check			3.4	37	119	0
FPLSD (0.10)			0.9	ns	ns	16

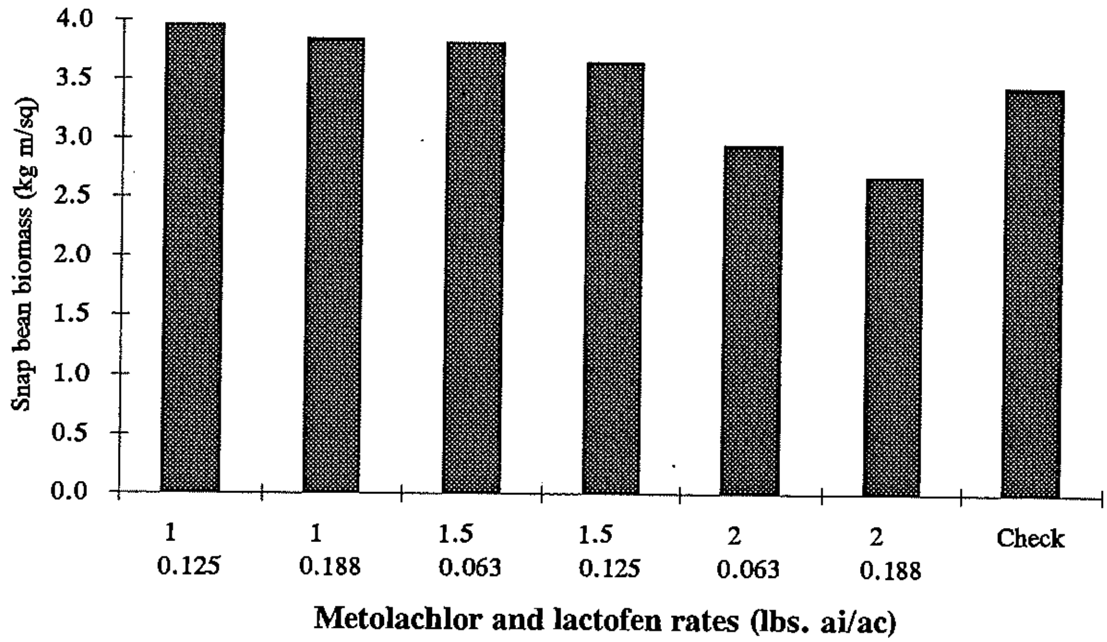

Figure 1. Snap bean tolerance to metolachor and lactofen.

Table 4. Herbicide application conditions.

Application date	May 13, 1996, 2 days after planting
Application timing	PES
Time of application	9:30-10:00
Air temp/ soil temp 2"(F)	62/62
Rel humidity (%)	92
Wind velocity (mph)	SW 0-3
Cloud cover	100 %
Soil moisture	very wet
Nozzle spacing and height	20/18"
Sprayer/ psi	unicycle/40 psi
Nozzle type	8003
Gals/A water	31
Incorporation	Excessive rain followed for next two weeks

Preplant and Preemergence Weed Control in Snap Beans

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Objectives

Evaluate metolachlor, dimethenamid, lactofen, sulfentrazone, FOE 5043, and clomazone for early season weed control in snap beans and tolerance of snap beans to these herbicides.

Methods

Snap beans were planted at the Vegetable Research Farm near Corvallis on a silty clay loam soil on June 7 in 7.5 by 30 ft plots, with three replications. PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application, and snap beans (var. OR 91G) were planted on 30 inch rows. PES herbicides were incorporated with 0.5 inches of irrigation 3 days after planting. Fonofos was applied and incorporated with the last tillage as a soil insecticide, before the PPI herbicides were applied. A single between-row cultivation was used to reduce weed competition. Hand hoeing and pulling were not used because of potential negative impact on crop growth.

Snap bean seedlings were counted 2 WAP from 3 linear ft of row. Emerged weeds were counted at 4 WAP from 11 ft^2 in each plot by species. Crop injury was evaluated as percent biomass reduction at 4 WAP.

Results and Discussion

Nightshades (Table 1). Dimethenamid was much more effective at controlling hairy nightshade (HNS) than metolachlor. The data is not conclusive for black nightshade (BNS) but indicates that EPTC does not control BNS as well as HNS. Metolachlor and dimethenamid may have controlled BNS better than HNS. Nightshade control with sulfentrazone was exceptional. Nightshades were completely tolerant to FOE 5043.

Combinations of EPTC with lactofen, or metolachlor and dimethenamid completely controlled nightshade at 4 WAP.

Pigweed. Most treatments controlled pigweed, including FOE 5043. Poor control was recorded with clomazone.

Other. Smartweed is difficult to control with currently registered PPI/PES herbicides in snap beans. Although the variability in this plot was high and statistically there was no difference among treatments at α=0.05, it is apparent that metolachlor had little effect on smartweed emergence. Dimethenamid alone reduced smartweed emergence more than metolachlor.

Snap bean tolerance (Table 2, see report Snap Bean Tolerance to Herbicides for more complete yield information). Dimethenamid applied PPI significantly injured snap beans at both the 1.2 and 2.5 lb ai/ac rates. Dimethenamid PES did not injure snap beans more than metolachlor PES at either rate.

From this and the previous two years of research, it is apparent that snap beans are less tolerant to dimethenamid than metolachlor when used at the rates listed in this trial. These rates reflect similar costs per acre for metolachlor and dimethenamid. Reducing the rate of dimethenamid might afford the same weed control and risk of injury to snap beans as metolachlor, with a slightly lower cost. However, the risk of injury with PPI applications may outweigh the benefits. PES applications potentially limit dimethenamid contact with the snap bean roots, but may not provide the crop safety needed if cool and very wet springs are encountered.

Snap beans were moderately tolerant of sulfentrazone. Sulfentrazone was tested primarily because of concerns that carryover from previous crops such as squash could affect snap bean growth. Given the tolerance levels demonstrated here, it is unlikely sulfentrazone applied the previous year would affect snap beans. As sulfentrazone was not tested PPI in this trial, it is not clear the impact that soil tillage and mixing might have on the tolerance of beans to sulfentrazone.

Snap beans were also tolerant to FOE 5043, but nightshade control was very poor. FOE 5043 in combination with lactofen could be a very good weed control program.

Table 1 . Weed emergence at 4 WAP, Corvallis, OR 1996.

	Herbicide	Timing	Rate	Hairy night-shade	Black night-shade	Pigweed	Purslane	Smart-weed	Barnyard -grass	Witch-weed	Total
				------------------------------			no/m sq	---------------------------------			
1.	Dimethenamid	PPI	1.25	1	0	0	0	0	0	0	1
2.	Dimethenamid	PES	1.25	0	0	0	1	0	0	0	1
3.	Dimethenamid Dimethenamid	PPI PES	0.75 0.50	1	0	0	0	1	0	0	4
4.	Metolachlor	PPI	2.00	13	4	1	6	8	0	0	32
5.	Metolachlor	PES	2.00	14	0	1	2	7	0	0	23
6.	Metolachlor Metolachlor	PPI PES	1.25 0.83	12	0	0	0	0	0	0	13
7.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0	0	0	0	3	0	0	3
8.	EPTC	PPI	3.50	8	7	1	3	4	0	0	23
9.	Lactofen	PES	0.13	3	4	0	0	2	6	13	28
10.	Lactofen	PES	0.19	0	0	0	0	2	7	12	21
11.	Metolachlor Lactofen	PES PES	2.00 0.13	0	0	0	0	9	0	0	9
12.	Metolachlor Lactofen	PES PES	1.00 0.19	0	0	0	0	0	0	0	0
13.	Dimethenamid Lactofen	PES PES	1.20 0.13	0	0	0	0	1	0	0	1
14.	Dimethenamid Lactofen	PES PES	0.75 0.19	0	0	0	0	0	0	0	0
15.	EPTC Lactofen	PPI PES	3.50 0.19	0	0	0	0	2	0	0	2
16.	Clomazone[1]	PES	0.50	0	2	4	0	4	0	0	11
17.	Sulfentrazone	PES	0.094	1	0	0	0	7	0	0	8
18.	Sulfentrazone	PES	0.188	1	0	0	0	4	3	7	19
19.	FOE 5043	PES	0.45	75	3	1	14	2	0	0	95
20.	FOE 5043	PES	0.9	83	5	0	0	0	0	0	128
21.	Check			74	21	36	30	4	22	13	170
	FPLSD (0.05)			36	ns	15	17	ns	ns	13	49

[1] ME (microencapsulated) formulation applied.

Table 2. Crop injury and snap bean seedling emergence at 3 WAP, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Injury rating	Emergence
			% growth reduction	No./3 ft of row
1. Dimethenamid	PPI	1.25	13	21
1a. Dimethenamid	PPI	2.50	10	20
2. Dimethenamid	PES	1.25	5	24
2a. Dimethenamid	PES	2.50	2	22
3. Dimethenamid Dimethenamid	PPI PES	0.75 0.50	0	23
4. Metolachlor	PPI	2.00	3	21
4a. Metolachlor	PPI	4.00	3	24
5. Metolachlor	PES	2.00	0	25
5a. Metolachlor	PES	4.00	0	23
6. Metolachlor Metolachlor	PPI PES	1.25 0.83	0	23
7. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	5	23
8. EPTC	PPI	3.50	0	26
9. Lactofen	PES	0.13	3	25
10. Lactofen	PES	0.19	2	20
11. Metolachlor Lactofen	PES PES	2.00 0.13	0	22
12. Metolachlor Lactofen	PES PES	1.00 0.19	7	25
13. Dimethenamid Lactofen	PES PES	1.20 0.13	0	24
14. Dimethenamid Lactofen	PES PES	0.75 0.19	2	25
15. EPTC Lactofen	PPI PES	3.50 0.19	2	26
16. Clomazone	PES	0.50	2	26
17. Sulfentrazone	PES	0.094	7	21
18. Sulfentrazone	PES	0.188	23	20
19. FOE 5043	PES	0.45	0	26
20. FOE 5043	PES	0.9	0	23
21. No herbicide	-	-	0	22
FPLSD(0.05)			7	NS

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96
Application timing	PPI	PES
Start/end time	1:00 - 2:00	6:00 - 8:30
Air temp/soil temp (2")/surface	86/88/94	NA
Rel humidity	50%	60%
Wind direction/velocity	NW, 1-5	0
Cloud cover	0	70
Soil moisture	Dry	Dry
Plant moisture	-	-
Sprayer/PSI	Uni /40	Uni/40
Mix size	2000 ml/3 plots	2000 ml/3 plots
Gallons H_20/acre	20	20
Nozzle type	8003	8003
Nozzle spacing and height	20/18	20/18
Soil inc depth (PPI/PRE)	2"	2"
Soil inc method/implement	Lely rotara & roller	0.5" irrigation (6/10/96)

Herbicide Impacts on Weed Growth and Survival in Snap Beans

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Objectives

1. Quantify impact of herbicides on weed survival and growth in snap beans within and between rows.
2. Develop an efficient evaluation system to estimate weed survival.

Methods

This research was conducted at a farm near Lebanon, OR and at the Vegetable Research Farm of OSU near Corvallis. Snap beans were planted at the Lebanon site on May 30, 1996 and at Corvallis on June 7 in 12.5 by 30 ft plots with three replications.

At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows, and PES herbicides were incorporated with 0.5 inches irrigation three days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and the field rolled before PES application. The grower applied treatment is Tr. 11 in Tables 5-7. Ethoprop and EPTC (PPI) were incorporated, snap beans planted on 24 inch rows (May 30), and lactofen applied, after which the field was rolled. The field was irrigated approximately one week later, just as the beans were emerging.

The weed emergence potential (as defined by the untreated check) at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis, weed emergence potential was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

At harvest, snap bean plants were pulled from 6.6 ft of row. Weeds in the cleared area were evaluated in: 1) a 10 inch band immediately over the row; and 2) the area between the rows according to the following size classes:

1. weeds ≥ 4 leaves, stem dia < 5.6 mm (sieve size 2).
2. weeds with stem dia. ≥ 5.6 mm
3. weeds with seeds or berries ≥ 5.6 mm
4. in the case of nightshade mature berries.

To analyze the data, each weed class size was multiplied by the number of each species surviving in each zone, whether between or in rows. The total value calculated for each species was then adjusted to compensate for the difference between the area in the row and the area between rows. A value of 0 would indicate no weeds present.

The advantage of this evaluation system is that it is quick, provides quantitative measurements rather than qualitative, is designed to reflect risk both this year and in future crops, and does not get bogged down in the voluminous and highly variable biomass and density measurements. Additionally, the values assigned to each size class can be adjusted to reflect immediate to long-term production concerns.

Results and discussion

The data for the Corvallis site is presented in Tables 1-4 and for the Lebanon site in Tables 5-7. The difference between in-row and between-row measurements indicates to some degree the compatibility of a particular herbicide with other strategies such as cultivation, which may or may not compliment the herbicide. For instance, PPI metolachlor was very poor at reducing nightshade growth in-rows, whereas metolachlor applied PES was more effective in-row but was not efficient between rows. This would indicate that a timely cultivation might be effective with PES metolachlor but would be very ineffective with PPI metolachlor. Low values within rows compared to high values between rows indicate treatments that would be complimented by cultivation.

Table 1. Nightshade survival and growth in response to herbicides, Corvallis, OR 1996.

Herbicide	Timing	Rate	Nightshade control rating			
			In-row	Middles	Difference (mid less in-row)	Total
1. Dimethenamid	PPI	1.25	0	2	2	2
2. Dimethenamid	PES	1.25	2	1	-2	3
3. Metolachlor	PPI	2.00	5	3	-2	9
4. Metolachlor	PES	2.00	2	6	-5	8
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0	0	0	0
6. EPTC	PPI	3.50	6	1	5	7
7. Lactofen	PES	0.13	0	0	0	0
8. Lactofen	PES	0.19	0	0	0	0
9. Metolachlor Lactofen	PES PES	2.00 0.13	0	0	0	0
10. Metolachlor Lactofen	PES PES	1.00 0.19	0	0	0	0
11. EPTC Lactofen	PPI PRE	3.50 0.19	0	0	0	0
12. EPTC	EPOST		4	0	-4	4
13. Clomazone	PES	0.50	0	0	0	0
14. One cultivation (no herbicide)	-		19	0	-19	19
15. Check (no herbicide)	-		15	19	4	34
FPLSD (0.10)			5	3	5	9

Table 2. Pigweed survival and growth in response to herbicides, Corvallis, OR 1996.

Herbicide	Timing	Rate	Pigweed control rating			
			In-row	Middles	Difference (mid less in-row)	Total
		lbs/A				
1. Dimethenamid	PPI	1.25	0	0	0	0
2. Dimethenamid	PES	1.25	0	0	0	0
3. Metolachlor	PPI	2.00	2	2	0	4
4. Metolachlor	PES	2.00	1	0	-1	1
5. Metolachlor	PPI	2.00	0	0	0	0
EPTC	PPI	3.50				
Trifluralin	PPI	0.50				
6. EPTC	PPI	3.50	4	2	-2	6
7. Lactofen	PES	0.13	0	0	0	0
8. Lactofen	PES	0.19	0	0	0	0
9. Metolachlor	PES	2.00	0	0	0	0
Lactofen	PES	0.13				
10. Metolachlor	PES	1.00	0	0	0	0
Lactofen	PES	0.19				
11. EPTC	PPI	3.50	0	0	0	0
Lactofen	PRE	0.19				
12. Bentazon	EPOST		12	10	22	22
13. Clomazone	PES	0.50	2	4	2	6
14. One cultivation	-		5	1	-4	6
15. Check no herbicide	-		10	21	11	31
FPLSD (0.10)			6	6	NS	9

Table 3. Comparison of weed growth ratings for between and inrow weed. Corvallis, OR, 1996.

Herbicide	Timing	Rate	Smartweed rating			
			Inrow	Middles	Difference	Total
1. Dimethenamid	PPI	1.25	4	0	-4	4
2. Dimethenamid	PES	1.25	0	0	0	0
3. Metolachlor	PPI	2.00	3	2	-2	5
4. Metolachlor	PES	2.00	0	1	1	1
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	1	0.3	-1	1
6. EPTC	PPI	3.50	4	2	-3	6
7. Lactofen	PES	0.13	0	2	2	2
8. Lactofen	PES	0.19	5	4	-1	9
9. Metolachlor Lactofen	PES PES	2.00 0.13	4	5	1	9
10. Metolachlor Lactofen	PES PES	1.00 0.19	0	0.5	1	1
11. EPTC Lactofen	PPI PRE	3.50 0.19	1	1	0	2
12. Bentazon	EPOST		4	0	-4	4
13. Clomazone	PES	0.50	5	15	10	20
14. One cultivation	-		5	0	-5	5
15. No herbicide	-		0	0.5	1	1
FPLSD (0.10)			ns	3.3	ns	9.00

Table 4. Herbicide effects on total weed control at snap bean harvest, Corvallis, OR 1996.

Herbicide	Timing	Rate	Cumulative rating for all weeds present			
			Inrow	Middles	Difference (middles less in-row)	Total
1. Dimethenamid	PPI	1.25	4	2	-2	6
2. Dimethenamid	PES	1.25	2	1	-2	3
3. Metolachlor	PPI	2.00	10	7	-3	17
4. Metolachlor	PES	2.00	3	8	5	11
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	1	0	-1	1
6. EPTC	PPI	3.50	14	4	-10	18
7. Lactofen	PES	0.13	3	8	5	11
8. Lactofen	PES	0.19	6	5	-1	11
9. Metolachlor Lactofen	PES PES	2.00 0.13	4	5	1	9
10. Metolachlor Lactofen	PES PES	1.00 0.19	0	1	1	1
11. EPTC Lactofen	PPI PRE	3.50 0.19	1	1	0	2
12. Bentazon	EPOST		26	15	-11	41
13. Clomazone	PES	0.50	8	20	12	28
14. One cultivation	-		30	1	-29	31
15. No herbicide	-		32	52	20	84
FPLSD (0.10)			9	9	9	16

Table 5. Nightshade response to herbicide and location in the field, Lebanon, OR, 1996.

	Herbicide	Timing	Rate	Nightshade control rating			
				Inrows	Middles	Difference	Total
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.3	0.9	0.6	1.3
2.	Dimethenamid	PES	1.25	0.0	0.5	0.5	0.5
3.	Metolachlor	PPI	2.00	2.0	0.7	-1.3	2.7
4.	Metolachlor	PES	2.00	1.3	5.2	3.9	6.5
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0.0	0.0	0.0	0.0
6.	EPTC	PPI	3.50	1.0	0.2	-0.8	1.2
7.	Lactofen	PES	0.125	0.0	0.0	0.0	0.0
8.	Lactofen	PES	0.1875	0.7	0.0	-0.7	0.7
9.	Metolachlor Lactofen	PES PES	2.00 0.13	0.0	0.0	0.0	0.0
10.	Metolachlor Lactofen	PES PES	1.00 0.19	0.0	0.0	0.0	0.0
11.	EPTC[1] Lactofen	PPI PES	2.8 0.188	0.7	1.7	1.0	2.3
12.	Clomazone	PES	0.50	1.3	4.0	2.7	5.4
13.	Bentazon	EPOST	1.00	0.0	0.4	0.4	0.4
14.	One cultivation			5.0	0.7	-4.3	5.7
15.	Check, no herbicide			2.0	3.8	1.8	5.8
	FPLSD(0.10)			1.6	2.7	ns	3

[1] Grower applied treatment.

Table 6. Lambsquarter response to herbicides and location in field, Lebanon, OR, 1996.

	Herbicide	Timing	Rate	Lambsquarter control rating			
				Inrows	Middles	Difference	Total
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.0	0.0	0.0	0.0
2.	Dimethenamid	PES	1.25	0.0	0.0	0.0	0.0
3.	Metolachlor	PPI	2.00	0.0	0.0	0.0	0.0
4.	Metolachlor	PES	2.00	1.0	1.4	0.4	2.4
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0.0	0.0	0.0	0.0
6.	EPTC	PPI	3.50	0.0	0.0	0.0	0.0
7.	Lactofen	PES	0.125	1.0	2.6	1.6	3.6
8.	Lactofen	PES	0.1875	0.0	0.0	0.0	0.0
9.	Metolachlor Lactofen	PES PES	2.00 0.13	2.3	2.1	-0.2	4.5
10.	Metolachlor Lactofen	PES PES	1.00 0.19	0.0	0.0	0.0	0.0
11.	EPTC[1] Lactofen	PPI PES	2.8 0.188	0.0	0.0	0.0	0.0
12.	Clomazone	PES	0.50	0.0	0.2	0.2	0.2
13.	Bentazon	EPOST	1.00	1.0	0.0	-1.5	1.5
14.	One cultivation			0.0	0.0	0.0	0.0
15.	Check: no herbicide			1.7	1.4	-0.2	3.1
	FPLSD(0.10)			1.2	2	ns	2.2

[1] Grower applied treatment.

Table 7. Summary table for Lebanon site, 1996.

	Herbicide	Timing	Rate	Total weed control rating by location in plot			Total weed rating
				Inrow	Middles	Difference	
			lbs ai/ac				
1.	Dimethenamid	PPI	1.25	0.3	0.9	0.6	1.3
2.	Dimethenamid	PES	1.25	4.0	0.5	-3.5	4.5
3.	Metolachlor	PPI	2.00	2.0	0.7	-1.3	2.7
4.	Metolachlor	PES	2.00	2.3	7.6	5.2	9.9
5.	Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	0.0	0.0	0.0	0.0
6.	EPTC	PPI	3.50	1.0	0.2	-0.8	1.2
7.	Lactofen	PES	0.125	1.0	2.6	1.6	3.6
8.	Lactofen	PES	0.1875	0.7	0.0	-0.7	0.7
9.	Metolachlor Lactofen	PES PES	2.00 0.13	2.3	2.1	-0.2	4.5
10.	Metolachlor Lactofen	PES PES	1.00 0.19	0.0	0.0	0.0	0.0
11.	EPTC[1] Lactofen	PPI PES	2.8 0.188	0.7	1.7	1.0	2.3
12.	Clomazone	PES	0.50	2.3	4.3	1.9	6.6
13.	Bentazon	EPOST	1.00	1.5	0.4	-1.1	1.9
14.	One cultivation			6.7	0.7	-6.0	7.4
15.	Check			5.3	5.9	0.6	11.3
	FPLSD(0.10)			2.8	4.2	ns	4.8

[1] Grower applied treatment.

Table 3. Herbicide application data, Corvallis, OR, 1996.

Application date	6-6-96	6-8-96	7-1-96
Application timing	PPI	PES	POST
Start/end time	1:00 - 2:00	6:00 - 8:30	7:00 - 8:00
Air temp/soil temp (2")/surface	86/88/94		69/68/72
Rel humidity	50%	60%	60%
Wind direction/velocity	NW (1-5)	0	0
Cloud cover	0	70	0
Soil moisture	Dry	Dry	Dry
Plant moisture	-	-	Dew
Sprayer/PSI	Uni /40	Uni/40	40
Mix size	2000/ 3 plots	2000/ 3 plots	1400/ 3 plots
Gallons H_20/acre	20	20	25
Nozzle type	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18
Soil inc depth (PPI/PRE)	2"		
Soil inc method/implement	Rotara & roller	0.5 " irrigation	

Table 4. Herbicide application data sheet, Lebanon, OR 1996

Application date	5-30-96	5-31-96	6-1-96	6-21-96
Application timing	PPI	PES	PES 2 (Trs 11 and 12)	POST
Start/end time	10:50-11:30	10:00 11:00	10:30 - 10:45	1st tri expanded 7:30-8:00
Air temp/soil temp (2")/surface	62.3/58.2	70.5/66.5	72/70/82	58/65/64
Rel humidity	40%	62%	70%	70%
Wind direction/velocity	NW 3.25 mph	2 SW	0-2 S	0
Cloud cover	50%	50%	0	100
Soil moisture	Dry Surface	Dry	Dry	Dry
Plant moisture	-	-	-	Dew (light)
Sprayer/PSI	Uni/40	Uni 40	Uni 40	40
Mix size	2 liters/3 plots	2 liters/3 plots	2 liters/3 plots	2/liter/3 plots
Gallons H_20/acre	30	30	30	30
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	19/18	19/18	19/18	19/17
Soil inc depth (PPI/PRE)	2"	-	-	
Soil inc method/implement	rototiller	irrigation 0.5 " approx.	-	

Impact of Herbicides and Cultivation on Snap Bean Yield

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Objectives

Determine impact of cultivation on yield of snap beans across herbicide treatments.

Methods

This research was conducted at a farm near Lebanon, OR and at the Vegetable Research Farm of OSU near Corvallis. Snap beans were planted at the Lebanon site on May 30, 1996 and at Corvallis on June 7 in 12.5 by 30 ft plots with three replications.

At Corvallis, PPI herbicides were applied and incorporated with a Lely rotara to 2 inches within 30 minutes after application. Snap beans were planted on 30 inch rows and PES herbicides were incorporated with 0.5 inches irrigation three days after planting. Fonofos was applied as a soil insecticide before the herbicides were incorporated.

At Lebanon, PPI herbicides were incorporated shortly after application with a rototiller and the field rolled before PES application. The grower applied treatment is Tr. 11 in Table 3. Ethoprop and EPTC (PPI) were incorporated, snap beans planted on 24 inch rows (May 30), and lactofen applied, after which the field was rolled. The field was irrigated approximately one week later, just as the beans were emerging.

The weed emergence potential (as defined by the untreated check) at Lebanon was relatively low with black nightshade and lambsquarters the primary species. At Corvallis, weed emergence potential was very high with hairy nightshade, pigweed, and smartweed as primary weeds.

Each plot at both sites was split into two parts. One half was cultivated at 4 WAP and the other half was left untouched. At Lebanon, cultivation was done with a hand push cultivator that removed all weeds except those within a 10 inch band over the row. At Corvallis, cultivation was done with a small tractor with sweeps set to remove all weeds except those within a 10 inch band in the row.

At harvest, snap bean plants were pulled from 6.6 ft of row, and total plant biomass weighed. Weed control estimates are presented from the Corvallis site because of the high density of weeds at this site and the close relationship with the number of weeds and yield in several of the treatments. At Lebanon, the weed population was much lower and effects on yield are more difficult to distinguish.

Results and discussion

Corvallis. Cultivation increased the yield of all but one treatment, and caused the largest biomass increase in the metolachlor PES, EPTC, lactofen (0.125), and bentazon treatments. Cultivation caused only a moderate increase in biomass for metolachlor (PPI) and lactofen (0.19) treatments. Most of the increases due to cultivation can be explained by improved weed control

(Table 2). However, the substantial decrease in the EPTC + lactofen treatment is unexplained. All weeds were controlled in this treatment except smartweed, and a single cultivation nearly eliminated smartweed from these plots. Metolachlor (PPI) did not give adequate control, and removing weeds in the row middles did little to improve yield.

Lebanon. The impact of cultivation was much less at the Lebanon site because weed density overall was lower. Even well-timed bentazon plus one cultivation yielded very well. The yield of the grower applied treatment of EPTC plus lactofen was very low and cultivation was no advantage. The greatest improvements in yield were in lactofen treatments that did not control lambsquarter (data not presented).

Table 1. Impact of cultivation on snap bean biomass production at harvest, Corvallis, OR, 1996.

Herbicide	Timing	Rate	Snap bean biomass yield		
			un-cultivated	cultivated	% inc
				---- t/ac----	
1. Dimethenamid	PPI	1.25	18.5	21.0	14
2. Dimethenamid	PES	1.25	19.3	20.2	5
3. Metolachlor	PPI	2.00	15.3	16.6	9
4. Metolachlor	PES	2.00	16.1	19.7	22
5. Metolachlor	PPI	2.00	19.8	21.9	11
EPTC	PPI	3.5			
Trifluralin	PPI	0.5			
6. EPTC	PPI	3.50	13.2	19.8	50
7. Lactofen	PES	0.13	13.3	19.1	44
8. Lactofen	PES	0.19	15.3	16.6	8
9. Metolachlor	PES	2.0	18.1	20.8	15
Lactofen	PES	0.125			
10. Metolachlor	PES	1.0	19.3	19.7	2
Lactofen	PES	0.19			
11. EPTC	PPI	3.5	18.8	15.9	-15
Lactofen	PRE	0.125			
12. Bentazon	EPOST	2.00	9.3	16.1	73
13. Clomazone	PES	0.25	15.4	20.0	29
14. No herbicide			5.5	15.3	177
FPLSD (0.05)			6.1	6.1	

Table 2. Impact of cultivation on snap bean biomass production and weed control, Corvallis, OR, 1996. Weed control was estimated at snap bean harvest.

Herbicide	Timing	Rate	Pigweed			Hairy nightshade			Smartweed		
			un-cultivated	cultivated	% inc	un-cultivated	cultivated	% inc	un-cultivated	cultivated	% inc
1. Dimethenamid	PPI	1.25	97	100	3	100	100	0	83	100	17
2. Dimethenamid	PES	1.25	67	98	32	100	100	0	97	100	3
3. Metolachlor	PPI	2.00	70	85	15	67	80	13	10	37	27
4. Metolachlor	PES	2.00	89	95	6	48	100	53	48	75	28
5. Metolachlor	PPI	2.00	100	100	0	100	100	0	67	87	20
EPTC	PPI	3.50									
Trifluralin	PPI	0.50									
6. EPTC	PPI	3.50	70	83	13	87	100	13	33	73	40
7. Lactofen	PES	0.13	100	100	0	100	100	0	0	85	85
8. Lactofen	PES	0.19	100	100	0	100	100	0	10	97	87
9. Metolachlor	PES	2	100	100	0	100	100	0	60	87	27
Lactofen	PES	0.125									
10. Metolachlor	PES	1	100	100	0	100	100	0	67	97	30
Lactofen	PES	0.19									
11. Bentazon	EPOST	1.0	0	65	65	33	60	27	83	88	5
12. Clomazone	PES	0.25	63	95	32	100	100	0	10	73	63
13. EPTC	PPI	3.5	100	100	0	100	100	0	13	100	87
Lactofen	PRE	0.125									
14. No herbicide			0	47	47	0	43	45	0	45	45
FPLSD (0.05)			25			32			48		

Table 3. Impact of cultivation on snap bean biomass yield, Lebanon, OR, 1996

Herbicide	Timing	Rate	Snap bean biomass yield		
			Uncultivated	Cultivated	Biomass increase
			t/ac	t/ac	%
1. Dimethenamid	PPI	1.25	16.2	18.8	14
2. Dimethenamid	PES	1.25	18.2	20.0	9
3. Metolachlor	PPI	2.00	18.9	21.1	10
4. Metolachlor	PES	2.00	21.2	21.1	-1
5. Metolachlor EPTC Trifluralin	PPI PPI PPI	2.00 3.50 0.50	19.4	22.1	12
6. EPTC	PPI	3.50	17.5	16.0	-10
7. Lactofen	PES	0.125	15.7	20.0	21
8. Lactofen	PES	0.1875	16.2	20.3	20
9. Metolachlor Lactofen	PES PES	2.00 0.13	20.8	18.5	-12
10. Metolachlor Lactofen	PES PES	1.00 0.19	17.8	19.0	6
11. EPTC (grower applied) lactofen	PPI PES	2.8 0.125	12.9	14.8	12
12. Bentazon	EPOST	1.00	15.9	20.7	23
13. Clomazone (ME)	PES	0.50	17.8	19.0	6
14 No herbicide			13.7	16.9	19
FPLSD(0.05)				2.6	

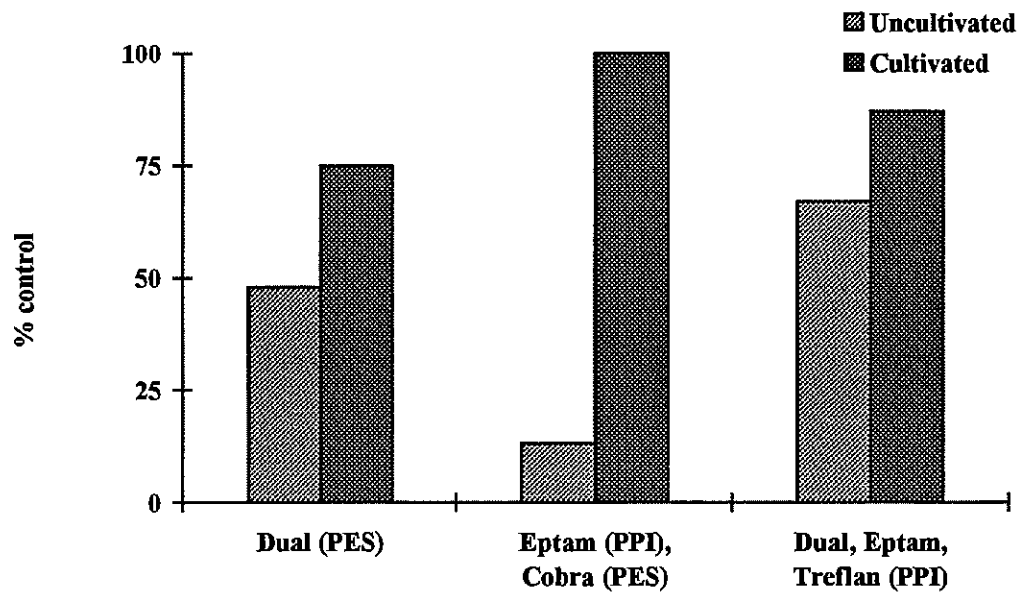

Figure 1. Smartweed control in snap beans at harvest, Corvallis, OR 1996.

Timing of Goal Application for Weed Control in Cauliflower

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Introduction and objectives

Growers have noted that weed control with Goal in transplanted cauliflower is erratic. When Goal is applied to a very dry soil surface in mid-day when soil temperature is very high, Goal efficacy is reduced. Rototilling just before application improves weed control but the effect is unpredictable. Goal is tightly adsorbed to soil particles and may be permanently adsorbed if soil moisture is very low. Perhaps this effect could explain these observations.

The objective of this research was to determine the effect of application timing on Goal weed control efficacy in cauliflower with three rates of herbicide and four levels of soil moisture..

Methods

Goal was applied pre-transplant surface to a silt loam soil near Mollala, OR, on July 24, 1996. Treatment variables were four application timings (afternoon or evening; before or after rototilling) and three herbicide rates (0.15/ 0.25, 0.5 lbs ai/acre) for a total of 12 treatments. The treatments that required rototilling just prior to herbicide application were applied in continuous strips across the entire plot (three blocks for replication). The experimental design was a complete factorial (4 timings by 3 herbicide rates) with three replicated blocks. The plot width was 15 feet but herbicides were applied to only 10 ft and the remaining 5 ft strip was used as a comparison for weed control estimates.

Emerged weeds were counted on September 6, six weeks after Goal application. Weed control was visually estimated again on Oct. 11, eleven weeks after treatment (WAT) by comparing weed density and growth to untreated check strips within the field. Data were analyzed as a factorial split-plot with main effects of soil management and herbicide rate.

Results and Discussion

Ideal conditions were available to test the hypothesis that soil moisture present at application determines efficacy of Goal herbicide. The soil had been last tilled one week prior to application and very hot and dry conditions caused very dry soil on the surface of plots. Soil moisture was good beneath the surface and rototilling brought moist soil to the 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. Afternoon soil surface temperatures were near 127 F in the untilled strip when the Goal herbicide was applied.

The most notable effect on weed control was caused by herbicide rate (Table 1-3). 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, did not conform to trends for lambsquarter and pigweed, and differences in treatment effects on nightshade were not statistically significant. Within the lower rates of Goal, however, emergence of pigweed at 6 WAT indicated that Goal application to recently tilled soil significantly reduced weed emergence. The trend was not consistent for lambsquarter and total weed emergence, however. Goal applied at 0.15 lbs ai/A in the afternoon to recently rototilled soil had the lowest total weed emergence overall 6 WAP.

A second visual estimation at 11 WAT again indicated that herbicide rate effects were much more important than application timing for all species evaluated. Nonetheless, pigweed and lambsquarter were controlled best by Goal applied in the evening whether rototilled on not before the application (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 was not consistent between species when applied in the afternoon or evening. Though the best practice can not be easily discerned from this data 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 dry soil at midday.

Table 1. Weed emergence in response to Goal herbicide application timing and rate 6 WAP, Mollala, OR 1996

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

Table 2. Weed emergence in response to low rates of Goal at four application timings, 6 WAP, Mollala, OR 1996

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

Table 3. Analysis of variance components for weed density at 6 WAP, Mollala, OR 1996

	Pigweed	Nightshade	Lambsquarter	Total
Timing and tillage	0.009	0.19	0.07	0.16
Herbicide rate	0.003	0.0013	0.0001	0.0001
Timing x herb rate	0.03	0.67	0.40	0.77

Table 4. Weed control at 11 weeks after planting in cauliflower, Mollala, OR, 1996

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

Table 5. Weed control estimate at 11 weeks after planting in cauliflower, Mollala, OR, 1996

	Timing and tillage	Goal rate	Pigweed	Nightshade	Lambsquarter	Overall control rating
		-lbs ai/ac-	---------------------------- % -------------------------------			
1	Aft, untilled	0.15	50	47	3	30
4	Eve, untilled	0.15	80	25	43	33
7	Aft, tilled	0.15	63	50	20	43
10	Eve, tilled	0.15	90	77	50	60
	FPLSD (0.05)		32	30	36	26

Table 6. Analysis of variance components for weed control estimates at 11 WAP, Mollala, OR 1996

	Pigweed	Lambsquarter	Nightshade	Overall control rating
Timing and tillage	0.40	.019	.037	.052
Herbicide rate	0.002	0.0001	0.0001	0.0001
Timing x herb rate	0.60	0.19	0.43	0.54

Table 7. Herbicide application details.
Plot size: 10*30

Application date	July 24, 1996	
Application timing	Afternoon (Preplant surface over untilled soil or within 10 minutes of rototilling)	Evening (Preplant surface over untilled soil or within 10 minutes of rototilling)
Time of application	1:15-2:00 PM	9:30-10:00 PM
Soil surface temp (F)	127 (untilled) 95 (rototilled)	77 (untilled) 71 (rototilled)
Air temperature	95	77
Rel humidity (%)	60	48
Wind velocity (mph)	0-3 N	0-2 N
Cloud cover	0	0
Soil moisture	damp	damp
Nozzle height	6"	6"
Sprayer/ psi	unicycle/40 psi	unicycle/40 psi
Nozzle type	8003	8003
Gals/A water	25	25

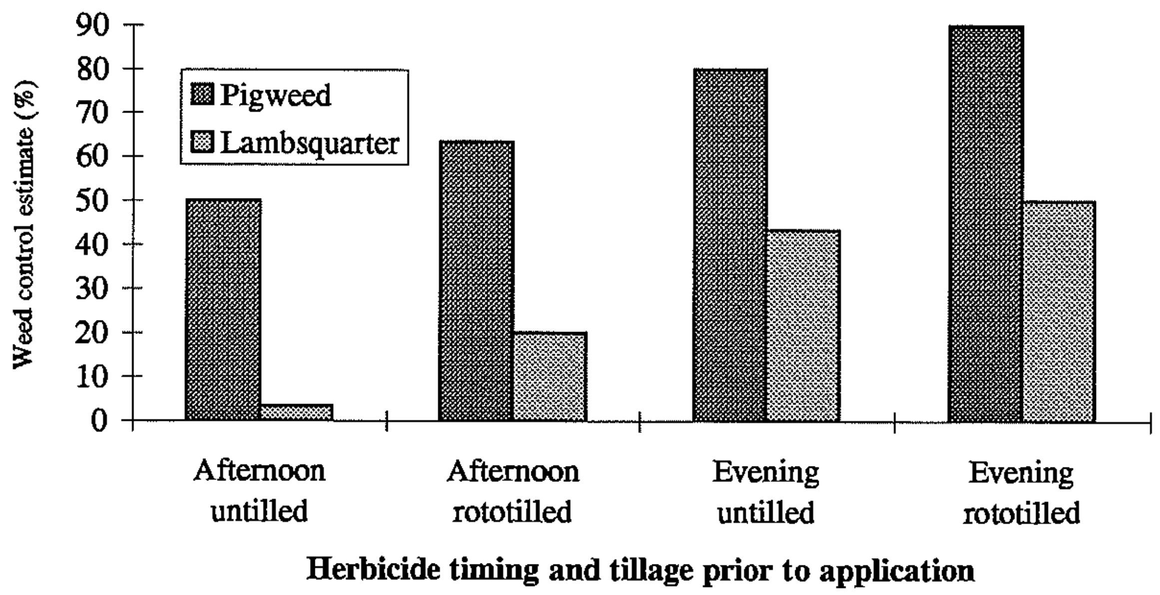

Figure 1. Effect of herbicide application timing and tillage prior to application on weed control in cauliflower, 11 weeks after application.

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

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Objectives

Determine potential of fertilizer impregnated with Goal and pyridate for postemergence weed control in broccoli.

Methods

Trifluralin was incorporated into the soil on the entire plot to suppress weeds until the fertilizer was applied. Broccoli and cauliflower were planted with a Gaspardo vacuum seeder on June 13 and July 22, respectively. 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 with a fertilizer spreader 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.

Results and discussion

Broccoli

Nightshade was the primary weed that emerged at this site because nightshade is extremely tolerant of trifluralin. Therefore, weed control was poor as nightshade also is moderately tolerant to Goal. Weed control diminished rapidly as the herbicide was applied later in the season. The fertilizer must be applied early enough so that it can distribute from the prills and establish a soil barrier before weeds break the surface. Crop injury from the Goal impregnated fertlizer was very low.

Pyridate was very effective for postemergence weed control but also severely injured the broccoli when applied when the broccoli had two true leaves. Pyridate is effective on many broadleaf weeds but timing with pyridate is very critical for proper weed control as demonstrated when applied to 6 leaf broccoli. A level of suppression greater than that afforded by trifluralin would be needed early in the season if pyridate is to be used for control for weeds such as nightshade.

Cauliflower

The initial treatment was applied just as the cauliflower was emerging. This application on cauliflower was moved up in an attempt to improve weed control. However, applying goal impregnated fertilizer at this stage significantly increased plant injury and reduced the number of surviving plants. Injury was much greater than in the broccoli trial, even at the one-leaf stage.

Weed control was exceptional in some of the treatments. One factor that may explain the difference with the results in the broccoli was that some of the fertilizer had a higher concentration of fines because it was the last of the fertilizer. We observed that this fertilizer dust adhered to the plants moreso than in the broccoli trial. Only two of the three plots were affected because the fertilizer fines fell from the applicator first, leaving the larger fertilizer particles. In any case it is doubtful that Goal impregnated fertilizer could be applied to emerging broccoli and cauliflower without serious injury to the crop, even without the increased activity of the fertilizer fines. Yield was not taken in this trial because club root also affected this planting.

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 fertlizer	0.25	Coty	23	0
2.	Goal impregnated fertlizer	0.5	Coty	73	0
3.	Goal impregnated fertlizer	0.25	2 leaf	0	0
4.	Goal impregnated fertlizer	0.5	2 leaf	53	0
5.	Goal impregnated fertlizer	0.25	4 leaf	0	7
6.	Goal impregnated fertlizer	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 fertlizer	0.25	Emerging	33	68
2. Goal impregnated fertlizer	0.5	Emerging	6	92
3. Goal impregnated fertlizer	0.25	Full cotyledon	29	40
4. Goal impregnated fertlizer	0.5	Full cotyledon	31	33
5. Check	-	-	37	2
FPLSD (0.05)			22	8

Table 3. Fertilizer and pyridate application data on broccoli.					
	Impregnated fertilizer 1	Impregnated fertilizer 2	Impregnated fertilizer 3	Pyridate #1	Pyridate #2
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
Start/end time	1-2:00 PM	1:30-1:45 PM	6:15-6:30 AM	8-9:00 AM	6:15-6:30 AM
Air temp/soil temp.(2")/surface temp.	65/-/-	80/81/84	62/68/68	72/67/70	62/68/68
Rel humidity	70%	60%	80%	50 %	80%
Wind direction/velocity	W 5-10	W 3-5	0	E 0-2	0
Cloud cover	60%	70%	0	50 %	0
Soil moisture	moist surface	dry	Damp from dew	Dry	Damp from dew
Plant moisture	dry	possible wet spots	dew wet	Dry	dew wet
Sprayer/PSI				40	40
Mix size	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			400 ml/3 plots	321 ml/3 plots
Gallons H_2O/acre				25	25
Nozzle type				8003	8003
Nozzle spacing and height				20/18	20/18

Table 4. Impregnated fertilizer application data on cauliflower.		
Application date	7/30/96	8/2/96
Application timing (crop stage)	Just emerging	Full cotyledon
Rel humidity	-	raining very lightly
Soil moisture	damp	wet
Plant moisture	dry	damp
Mix size	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	

Cucumber Herbicide Efficacy Field Study-1996

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Justification

Cucurbit growers have a limited number of herbicides to consider as alternatives to Amiben which was withdrawn a number of years ago. The currently registered products, Alanap, Prefar, Command and Curbit all have limitations in terms of weed control spectrum, method of application, crop safety or cost. Annual field trials, in which new products are tested and the application methods for registered herbicides refined, are essential in order to improve weed control strategies for cucurbit growers.

Objectives

The objectives of the 1996 field trial were to evaluate the effectiveness of two new chemicals; clomazone micro-encapsulated from FMC that can be incorporated with water, and United Agri Products numbered compound PCC 170. Clomazone ME has been tested in previous years whereas PCC 170 is a new product. The objective with clomazone ME was to establish a base rate for weed control that is as effective as the EC formulation. PCC 170 was to be evaluated in comparison to clomazone EC and ethalfluralin for crop safety and weed control effectiveness.

Methods

One trial was established at NWREC on 5/31/96 on a Willamette Silt Loam soil. The design was RCB with 3 replications. Individual plot dimensions were 5.5 x 60 ft. These dimensions were selected in order to duplicate grower conditions as much as possible, by using tractor-mounted equipment for all operations. The pre-plant treatments were applied with a tractor-mounted CO_2 sprayer to a disked field surface on 5/31/96 and incorporated 4 to 6 inches deep with a rotary tiller. One clomazone 0.25 PPI treatment was surface applied and shallowly incorporated by dragging a 6-ft section of chainlink fence behind a tractor. Each plot was seeded on 6/3/96 with 2 seed rows spaced 15 inches apart with the pickling cucumber variety, Pioneer. The pre-emergence treatments were applied immediately after seeding. The CO_2 sprayer was equipped with three-8002 fan nozzles spaced 19 inches apart set to deliver 600 ml of herbicide solution at 40 psi to each plot. Weather conditions at the time of application were; Air 78F, RH 70%, Soil 69F, Sun 100%, wind-slight breeze to the NE. Shallow incorporation was completed by dragging chainlink fence over those treatments for which it was required. The trial was irrigated with approximately one inch of water by overhead sprinklers following treatment applications. The plot was irrigated twice weekly for the first month and once a week thereafter. Urea was applied at a rate of 50 lb./acre preplant and on 6/27/96, which corresponded to the 2 to 3 true leaf stage and again on 7/17/96 at the runner stage of growth. The handweeded control was weeded mechanically and by hand on 7/15/96. Weeds were not removed from the other treatments.

Results

Phytotoxicity

All of the clomazone treatments showed typical marginal chlorosis of the cotyledons. The symptoms were not observed on subsequent growth. A few plants in areas were irrigation water accumulated in the 1x and 2x rates of PCC 170 died in the cotyledon to 1st true leaf stage. This was not observed in other treatments were puddling occurred. Stand counts were made on 6/14/96. Surprisingly, plant stands in the 1/2x PCC 170 treatment were significant lower than in the PCC 170 1x and the clomazone PPI shallow incorporated treatments. In the case of clomazone PPI, it was likely that the planter shoe plowed treated soil away from the seed lines resulting in better seed germination and survival. Initially, there was some concern that incorporation of PCC 170 might cause injury. However, other than the problem noted here, the stand counts seem to indicate otherwise.

Weed Control

Weeds present in the trial area included pigweed, dog fennel, shepherdspurse, lambsquarter, groundsel and some nightshade. Based upon observations and the weed density measurements, PCC 170 1x and 2x, clomazone ME and clomazone EC pre-emergence treatments provided the best weed control. The 1/2x rate of PCC 170 was much less effective than the higher rates. The weed density measurements were made late in the production cycle and therefore reflect the residual control of the treatments. Both pigweed and shepherdspurse are problem spring weeds whose control is critical. PCC 170 was very effective in providing long term control of these weeds. The most frequent weed escapes in the PCC 170 and the Prefar + Alanap treatments were shepherdspurse and dog fennel. In the clomazone ME and EC preemergence treatments the predominant escape was pigweed. Weed densities are included in the table below.

Yield

The plot was harvested on 8/19/96. Plants from a ten-foot section of both rows in each plot were stripped of all fruit and the fruit weighed. Cucumber fruits from all plots were pinched at the blossom end. This condition could have been caused by high temperatures during fruit set, insufficient irrigation or a lack of pollinators. Generally, yield was inversely correlated to weed population. The 1x rate of PC 170 yielded significantly more fruit than either of the clomazone PPI treatments and the ethalfluralin. The 2x rate was only better than the PPI rototilled clomazone and the ethalfluralin. The yield of the ME formulation was statistically comparable to all other treatments. Yield results are included in the table below.

Table 1. Pre-plant and pre-emergence herbicides applied to cucumbers-NWREC, 1996.

Treatment	Rate lb. ai/a	Mean Yield[1]	Weed Density[2]	Stand Count[3]
PCC 170 PREE [4]	1x	13.7 a	17 abc	64 a
PCC 170 PREE [4]	2x	12.5 ab	3 a	55 ab
PCC 170 PREE [4]	1/2x	11.8 abc	30 abcd	47 b
Clomazone EC PREE[4]	0.25	9.9 abcd	17 abc	57 ab
Clomazone ME PREE	0.33	9.6 abcde	7 ab	57 ab
Alanap+Prefar PPI Rototill	4 + 6	9.3 abcde	30 abcd	54 ab
Clomazone EC PPI [4]	0.25	7.5 bcde	34 abcd	62 a
Ethalfluralin EC PREE	0.75	7.1 cde	46 bcd	51 ab
Handweeded	---	6.8 cde	52 cd	58 ab
Weedy Control	---	5.6 de	41 abcd	61 ab
Clomazone EC PPI Rototill	0.25	3.9 e	71 d	54 ab
LSD 0.05		5.25	40.8	14.71

1. Mean of total fruit harvested for 10 ft of row/plot, kg.
2. Mean number of weeds/4 sq ft/plot.
3. Mean number of cucumber seedlings for 2-3 ft sections of each seedline/plot.
4. Chainlink fence drag incorporated.

Conclusions

The efficacy obtained with PCC 170 was better than either ethalfluralin or clomazone PPI. It provided good broad spectrum and long term weed control. Crop safety was not a problem with the exception of areas where water tended to puddle. By limiting competition from weeds, the PCC 170-treated plots yielded more than the other treatments. The broad spectrum of weeds controlled by PCC 170 would fit well in cucurbit production systems in Oregon and should be tested in future trials to confirm the 1996 results.

Currently, the label for clomazone specifies shallow incorporation. Deep incorporation as was achieved in this trial by using a rototiller, dramatically reduces its effectiveness. By using a chainlink fence drag, weed control was greatly improved which was demonstrated in 1995 and confirmed in this trial. The ME formulation of clomazone at 0.3 lb. ai/acre provided a very acceptable level of weed control in comparison to the EC preemergence shallow incorporated. The simplified application method for the ME formulation would be an advantage to growers in the northwest where spring rains can usually be expected. Future trials are needed to establish the upper rate limit on crop safety and plant-back as well as to confirm 1996 performance results.

Sweet Corn Tolerance to Herbicides

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Objectives

Evaluate tolerance of *Jubilee* and *Super Sweet Jubilee* sweet corn to dimethenamid (Frontier), acetochlor (Surpass), metolachlor II (Dual plus safener), nicosulfuron (Accent), halosulfuron (Battalion), FOE 5043 + metribuzin (Axiom), prosulfuron (Peak), and pyridate (Tough).

Methods

This trial was located on a silty clay loam soil at the Vegetable Research Farm near Corvallis, OR with 4 replications. *Jubilee* and *Super Sweet Jubilee* were planted on June 9, 1996 in two separate blocks on 30 inch rows. Fonofos (Dyfonate), an organophosphate insecticide that may intensify nicosulfuron injury to sweet corn, was incorporated before planting. Sweet corn seedlings were thinned to approximately equal populations within each plot shortly after emergence, and the plots were cultivated and hand-hoed to remove weeds not controlled by the herbicides.

Herbicides were applied with a unicycle plot sprayer except for the postemergence-directed (POSTD) treatments that were applied with a hand wand with 8003 nozzles. The wand was held so that the spray completely covered the plot area between rows but missed the corn whorl.

First ears of each plant were harvested on September 12. Because of an apparent root disease in some areas of the *Jubilee* field, some treatments only have 2 or 3 observations as noted in the column in Table 1 designated *n*. Plots that were visibly affected by the disease were not harvested and were located primarily in one replication on the west end of the field.

Results

Jubilee tolerance and yield (Table 1 and 2). Of the chloroacetamide treatments (acetochlor, metolachor, FOE 5043, and dimethenamid), dimethenamid PPI injured sweet corn most at 4 WAP.

At 8 WAP dimethenamid PPI, nicosulfuron broadcast with both dimethenamid and metolachlor, prosulfuron broadcast, and nicosulfuron applied with pyridate and atrazine significantly injured corn. Directing nicosulfuron reduced corn injury. However, variability in this plot was high because of poor planting conditions at one end of the field that increased corn injury overall.

Nicosulfuron (POST) reduced yield most in this trial, particularly when broadcast. Approximately 60 percent of the ears had visible nicosulfuron injury symptoms. Directing the nicosulfuron application maintained ear quality but a yield decrease was still apparent. Directing the application of prosulfuron also increased yield, although ear injury symptoms were not apparent with either directed or post-directed application.

Dimethenamid PPI decreased yield substantially. A similar trend was noted with acetochlor PPI. Halosulfuron POST also reduced sweet corn yield and ear quality but did not affect yield when applied PES.

Treatments with the greatest yield were the split application of metolachlor at the maximum use rate, the split treatment of metolachlor PPI and dimethenamid PES, and metolachlor plus halosulfuron PES.

Super Sweet Jubilee tolerance and yield (Table 3 and 4). No significant trends were noted for crop emergence. At 4 WAP there was evidence of injury in the dimethenamid and acetochlor treatments, but the injury was inconsistent across the four replications. At 8 WAP, injury was most severe in the nicosulfuron broadcast treatment but also was apparent in the halosulfuron POST treatment.

The FOE 5043 plus metribuzin treatment had the greatest yield at 9.8 t/ac followed closely by atrazine at 9.6 tons/ac. Nicosulfuron significantly decreased yield and ear quality whether applied as a directed or broadcast application. Surprisingly, broadcast prosulfuron did not reduce yield compared to the atrazine treatment and directing the application of prosulfuron had no effect on yield, a departure from the results of the same treatment on 'Jubilee' both this year and in 1995. As in the *Jubilee* trial, halosulfuron POST depressed sweet corn yield.

Discussion

Dimethenamid injury was greatest when applied PPI, a trend that has been evident the last three years but with some exceptions. Acetochlor was less likely to injure sweet corn than dimethenamid. Significant injury was seldom noted with metolachlor II (II product includes a safener for sweet corn).

Nicosulfuron injury was much greater than in previous years' research. No cob injury was observed in 1995 with the same set of treatments whether the herbicide was directed or broadcast. Dyfonate was applied each year to control soil insects. Possible explanations include the severe temperature shifts of mid-July that may have stressed the corn. Moisture was maintained throughout the season with approximately one inch applied per week. Injury was no greater in the *Super Sweet Jubilee* than in the *Jubilee* trial.

Halosulfuron injured corn and reduced yield when applied POST but not when applied PES.

Pyridate injury was usually visible just after application but did not significantly reduce yield in either variety. Pyridate plus nicosulfuron plus atrazine significantly injured sweet corn early in the seasons and caused multiple ears to form, but did not reduce yield.

FOE 5043 plus metribuzin (Axiom) did not injure corn early in the season but may have reduced yield in the *Jubilee* trial. There was no injury or yield reduction from Axiom in the *Super Sweet Jubilee* trial, and this treatment had the highest yield. The primary difference between the *Jubilee* and *Super Sweet Jubilee* site was the root disease that impacted crop yields in the *Jubilee* trial, and this soil factor may have interacted with the Axiom treatment to slightly reduce yield.