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Title: Vegetation Management in Sweet Corn

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Summary

Several weed management options for sweet corn were tested in two on-farm sites and at the research farm. Dimethenamid, acetochlor and metolachlor controlled atrazine tolerant pigweed when applied post plant, preemergence to the soil surface (PES). Efficacy was greatly reduced and corn injury potential increased by pre-plant incorporating these herbicides. Wild proso millet suppression was best with acetochlor but far from adequate. Split applications of these herbicides did not improve millet control. Nicosulfuron applied postemergence after metolachlor completely controlled both pigweed and proso millet. However, herbicide injury was evident where nicosulfuron was broadcast. Minimizing herbicide contact with newly emerging corn leaves dramatically reduced yield loss. Cost of these herbicides range from $15-18/acre at suggested label rates, a significant increase over the cost of atrazine.

Propane flaming was used effectively to control pigweed and suppress other weeds emerging within the corn row without reducing corn yield. One to two applications were needed at a total cost of $9-18/acre (propane only). Common purslane was the most difficult weed to control. Flaming corn just before or after sweet corn emergence significantly improved control of common purslane.

Planting into undisturbed cover crop residues dramatically lowered summer annual broadleaf emergence. Pigweed control with dimethenamid was reduced slightly by the cover crop residues compared to metolachlor. Incorporating cover crops essentially removed any effect on weed suppression. Planting into undisturbed soil was made possible by a two-row cross slot drill that improved seed to soil contact and reduced disturbance in the row. Fertilizer (100 lbs N/acre) was banded at planting without any effect on the sweet corn. Average yields in the cover crop residue plots were equal to or greater than the conventional tillage plot.

Objectives

1. Evaluate herbicides with near term availability such as dimethenamid, acetochlor, and nicosulfuron for both weed control efficiency and effect on sweet corn growth.

2. Determine tolerance of sweet corn to propane flaming and efficiency of in-row weed control

3. Evaluate impacts of cover crop residues and tillage systems on weed emergence.

4. Evaluate a novel planter design for planting in conventional and conservation tillage environments.

Report of Progress

1. Weed control with herbicides

Treatments were applied at three sites to plantings of Golden Jubilee sweet corn. In Stayton, high populations of atrazine tolerant pigweed and wild proso millet were present. Atrazine tolerant weeds were also present at the Junction city site. Tolerance of sweet corn to herbicides was evaluated at the Vegetable Research Farm in Corvallis. After the initial weed evaluation, plants were thinned and plots kept weed free with hand hoeing and cultivation. Dyfonate was broadcast before planting at Corvallis to evaluate possible interactions with postemergence herbicides. Rates used in these trials represent comparative labeled rates for each herbicide. See Table 2 for herbicides tested, and rates used in these trials.

Table 1. Site descriptions and application timing.

Site	Planting date	PPI Preplant incorporated	PES Preemergence surface	EPOST Early postemergence	POST Late postemergence	Comments
Stayton Table 3	May 22	May 19	May 23	June 9	June 30	Atrazine tolerant pigweed and wild proso millet.
Junction city Table 4	June 28	-	July 1	July 13	July 29	Atrazine tolerant pigweed
Corvallis Table 5-7	June 6	June 7	June 8	July 11	July 14	Tolerance trial, plots weeded

Table 2. Herbicides tested in trials.

Herbicide	Product Names	Rates tested in these trials	Registration Status	Comments
Acetochlor	Harness, Surpass	2.00	Unknown	chloroacetamide similar to metolachlor and dimethenamid
Dimethenamid	Frontier, Guardian	1.20	Possible 1996	Guardian=dimethenamid+atrazine
Halsosulfuron	Battalion (safener) Permit	.031 POST .065 PES	Unknown	PPI,PES and POST; good control of pigweed, nightshade tolerant
Metolachlor	Dual, Dual II	2.00	Current	II has a safener with slighlty higher cost
Metribuzin + chloroacetamide	Axiom	0.72	3+ Years	Suppression of proso millet in some situations, PES and POST
Nicosulfuron	Accent	.031	Possible 1996	SU, good on millet and pigweed, injury concern with OP insecticides
Prosulfuron	Peak (proposed)	0.179	Unknown	Sulfonylurea (SU), postemergence with residual
Pyridate	Tough	0.75-0.94	Unknown	Sweet corn tolerance may be a concern

<u>**Preemergence:**</u> Preplant Incorporated (PPI) and Preemergence Surface (PES).

Atrazine tolerant pigweed control was best with dimethenamid, metolachlor, and acetochlor applied preemergence after planting (PES). Preplant incorporating (PPI) the herbicides significantly reduced efficacy. The reduction in weed control was the most dramatic for metolachlor when applied PPI, particularly at the Stayton site where the soil was very cloddy. Adding atrazine at a low rate improved pigweed control for dimethenamid at the Stayton site but did not improve efficacy at the Junction City site.

In rainy conditions shortly after planting (Corvallis site), pigweed control with metolachlor deteriorated more rapidly than dimethenamid. Lambsquarter control was very poor with dimethenamid. However, dimethenamid controlled nightshade better than metolachlor. Split applications did not improve herbicide efficacy for any of the preemergence herbicides.

Wild proso millet suppression was good with acetochlor, fair for dimethenamid, and fair to poor with metolachlor (Table 3). However, proso millet control with dimethenamid and even acetochlor was far less than required in most situations. EPTC with a safener (Eradicane) applied preplant and incorporated immediately after it was applied suppressed wild proso millet in the adjacent field better than metolachlor and dimethenamid and slightly better than acetochlor. Split applications of metolachlor, dimethenamid and acetochlor did not improve millet control and in some cases reduced millet control. The success of this strategy is determined by the location of the weed seed.

<u>**Postemergence:**</u> 6 inch corn (EPOST) and 12 inch corn (POST).

Atrazine tolerant pigweed. Pyridate was a very effective herbicide for early postemergence control of atrazine tolerant pigweed. However, signs of corn injury were evident at all three locations. Prosulfuron and nicosulfuron are sulfonylurea herbicides that effectively controlled pigweed when applied to actively growing pigweed. However, injury from both herbicides was evident in some situations.

Wild Proso millet. Nicosulfuron applied postemergence after metolachlor controlled both pigweed and wild proso millet but corn showed some signs of injury if the herbicide was broadcast and organo-phosphate insecticides such as Dyfonate were used. Additional constraints are soil carryover to succeeding crops, especially in high pH soils. Semi directed applications significantly reduced the potential for injury.

Pyridate (EPOST) in combination with dimethenamid (PPS) suppressed proso millet but the impact was short lived and had no residual effect. Injury was apparent from this treatment.

<u>**Sweet corn injury**</u>

Early season injury was highest when dimethenamid and acetochlor were applied PPI, and confirms results of previous years. Injury tends to be less with metolachlor applied PPI. Mean corn yields of all the treatments were slightly lower with metolachlor, dimethenamid, and acetochlor compared to the atrazine treated control, though the differences were not great (Table 7). Even treatments that showed no sign of injury early in the season may have been injured and yield reduced. Split applications may reduce the risk of injury for dimethenamid but there was no advantage to this strategy over PES applications for control of either pigweed or wild proso millet. Directed applications of nicosulfuron reduced injury to sweet corn significantly (Table 8). Nozzles were placed so that spray droplet contact with newly emerging corn leaves (whorl area) was minimized. The same application technique did not reduce prosulfuron injury.

Table 3. Atrazine tolerant pigweed and wild proso millet control in sweet corn, Stayton, OR, 1995.

No.[1] Herbicide	Timing	Rate	Percent weed control				Corn injury
			June 22 (4 WAP)		July 7 (6 WAP)		
		lbs ai/A	Pigweed	Proso millet	Pigweed	Proso millet	-%-
1. Dimethenamid	PPI	1.2	83	35	70	15	18
2. Dimethenamid	PES	1.2	93	57	70	35	13
3. Dimethenamid	PPI	0.7	83	40	68	30	10
Dimethenamid	PES	0.5					
4. Dimethenamid	PPI	1.2	88	50	43	15	13
Atrazine	PES	0.5					
5. Dimethenamid	PES	1.2	100	65	99	43	5
Atrazine	PES	0.5					
6. Dimethenamid	PPI	1.15	90	30	43	10	18
Atrazine	PPI	1.32					
7. Dimethenamid	PES	1.15	98	67	98	28	3
Atrazine	PES	1.32					
8. Dimethenamid	PPI	0.75	100	73	100	63	8
Atrazine	PPI	0.87					
Dimethenamid	PES	0.75					
Atrazine	PES	0.87					
9. Metolachlor II	PPI	2.0	45	15	18	5	15
10. Metolachlor II	PES	2.0	95	50	83	48	3
11. Metolachlor II	PPI	1.25	100	45	73	43	3
Metolachlor II	PES	0.75					
12. Metolachlor II	PES	2.0	95	40	38	28	8
Atrazine	PES	0.5					
13. Acetochlor	PPI	2.0	100	53	73	30	10
14. Acetochlor	PES	2.0	100	85	100	53	0
15. Acetochlor	PES	2.0	100	80	74	55	8
Atrazine	PES	0.5					
16. Acetochlor	PPI	0.93	75	65	100	23	3
Acetochlor	PES	0.67					
17. Metolachlor II	PES	2.0	-	-	100	28	-
Prosulfuron directed	POST	0.0179					
18. Metolachlor II	PES	2.0	-	-	100	30	-
Prosulfuron broadcast	POST	0.0179					
19. Metolachlor II	PES	2.0	-	-	98	98	-
Nicosulfuron directed	POST	.0310					
20. Metolachlor II	PES	2.0	-	-	100	100	-
Nicosulfuron broadcast	POST	.0310					
23. Dimethenamid	PES	1.2	100	78	100	65	18
Pyridate	EPOST	0.94					
24. Dimethenamid	PES	1.2	100	83	86	58	13
Pyridate	EPOST	0.70					
Atrazine	EPOST	0.5					
25. Dimethenamid	PPI	1.2	100	70	73	48	23
Pyridate	EPOST	0.94					
26. Dimethenamid	PPI	1.2	98	72	78	70	30
Pyridate	EPOST	0.70					
Atrazine	EPOST	0.94					
27. Atrazine	PES	1.0	8	10	0	5	33[2]
28. Control		-	0	0	-	-	0
29. Atrazine	EPOST	0.5	18	0	-	-	0
30. Atrazine	EPOST	1.0	33	0	-	-	0
LSD (P=0.05)			25	23	45	27	16

[1] Treatment numbers correspond with treatments listed in following tables.

[2] High injury because of severe competition from wild proso millet.

Table 4. Weed control and crop injury at Crosson Farms, Junction City OR.

No.	Herbicide	Timing	Rate	July 29, 1995 4 WAP		August 17, 1995	
				Pigweed control	Corn injury	Pigweed control	Corn injury
			lbs ai/A	-%-	-%-	-%-	-%-
2.	Dimethenamid	PES	1.20	95	0	100	0
5.	Dimethenamid	PES	1.20	95	0	100	0
	Atrazine	PES	0.50				
7.	Dimethenamid	PES	1.15	88	0	100	0
	Atrazine	PES	1.32				
10.	Metolachlor	PES	2.00	98	0	100	0
12.	Metolachlor	PES	2.00	92	0	100	0
	Atrazine	PES	0.50				
14.	Acetochlor	PES	2.00	98	0	100	0
15.	Acetochlor	PES	2.00	100	0	67	33
	Atrazine	PES	0.50				
17.	Metolachlor	PES	2.00	-	-	97	3
	Prosulfuron (directed)	POST2	0.0179				
18.	Metolachlor	PES	2.00	-	-	100	33
	Prosulfuron (broadcast)	POST2	0.0179				
23.	Dimethenamid	PES	1.20	-	-	100	13
	Pyridate	POST	0.94				
24.	Dimethenamid	PES	1.20	-	-	100	20
	Pyridate	POST	0.94				
	Atrazine	POST	0.50				
27.	Atrazine	PES	0.50	0	0	0	0
28.	Control			0	0		
29.	Axiom	PES		72	0	95	0
30.	Basagran	POST	1.00	85	0	100	0
	Atrazine	POST	0.50				
31.	Atrazine	POST	0.50	0	0	0	0
32.	Pyridate	POST	0.94	95	0	100	7
33.	Pyridate	POST	0.94	100	7	100	3
	Atrazine	POST	0.50				
35.	Basagran	POST	1.00	95	0	50	0
37.	Prosulfuron (broadcast)	POST2	0.0179	-	-	57	13
	LSD (P=0.05)			10	6	30	23

Table 5. Control of **non-tolerant** weeds in sweet corn with pre-plant incorporated and preemergence herbicides, Vegetable Research Farm, Corvallis, OR, 1995.

No.	Herbicide	Timing	Rate	Percent broadleaf weed control			
			lbs ai/ac	Pigweed	Lambsquarter	Nightshade	Common purslane
1.	Dimethenamid	PPI	1.20	77	100	47	97
2.	Dimethenamid	PES	1.20	100	97	95	100
3.	Dimethenamid	PPI	0.70	99	98	83	100
	Dimethenamid	PES	0.50				
4.	Dimethenamid	PPI	1.20	100	100	95	100
	Atrazine	PES	0.50				
5.	Dimethenamid	PES	1.20	100	100	100	100
	Atrazine	PES	0.50				
6.	Dimethenamid	PPI	1.15	93	100	80	100
	Atrazine	PPI	1.32				
7.	Dimethenamid	PES	1.15	75	75	75	75
	Atrazine	PES	1.32				
8.	Dimethenamid	PPI	0.75	100	100	100	100
	Atrazine	PPI	0.87				
	Dimethenamid	PES	0.75				
	Atrazine	PES	0.87				
9.	Metolachlor II	PPI	2.00	73	70	33	60
10.	Metolachlor II	PES	2.00	98	84	98	98
11.	Metolachlor II	PPI	1.25	59	98	25	88
	Metolachlor II	PES	0.75				
12.	Metolachlor II	PES	2.00	100	100	96	100
	Atrazine	PES	0.50				
13.	Acetochlor	PPI	2.00	100	96	88	90
14.	Acetochlor	PES	2.00	100	100	100	100
15.	Acetochlor	PES	2.00	100	100	100	100
	Atrazine	PES	0.50				
16.	Acetochlor	PPI	0.93	100	80	100	100
	Acetochlor	PES	0.67				
29.	Axiom	PES	0.72	100	100	30	100
27.	Atrazine	PES	1.00	100	100	100	100
28.	Control:no herbicide			0	0	0	0
	LSD (P=0.05)			23	38	33	34

Table 6. Tolerance of sweet corn to preemergence herbicides, Vegetable Research Farm, Corvallis, OR, 1995.

No.	Herbicide	Timing	Rate	Corn injury	Corn emergence	Sweet corn yield	No ears	Avg. ear wt	Maturity index
			lbs ai/ac	-%- (4 WAP)	(no.4' row)	-t/A-	(no/15' row)	lb.	(100= mature)
1.	Dimethenamid	PPI	1.20	0	9.3	11.6	23	0.73	94
2.	Dimethenamid	PES	1.20	0	9.0	10.5	23	0.69	96
3.	Dimethenamid	PPI	0.70	3	9.0	10.7	23	0.71	96
	Dimethenamid	PES	0.50						
4.	Dimethenamid	PPI	1.20	3	10.0	11.7	22	0.65	93
	Atrazine	PES	0.50						
5.	Dimethenamid	PES	1.20	0	9.3	10.6	23	0.70	99
	Atrazine	PES	0.50						
6.	Dimethenamid	PPI	1.15	5	9.0	10.9	24	0.72	96
	Atrazine	PPI	1.32						
7.	Dimethenamid	PES	1.15	0	10.5	10.4	24	0.69	99
	Atrazine	PES	1.32						
8.	Dimethenamid	PPI	0.75	8	10.0	10.3	23	0.68	91
	Atrazine	PPI	0.87						
	Dimethenamid	PES	0.75						
	Atrazine	PES	0.87						
9.	Metolachlor II	PPI	2.00	0	10.8	11.2	24	0.75	96
10.	Metolachlor II	PES	2.00	0	10.3	10.8	22	0.72	99
11.	Metolachlor II	PPI	1.25	0	8.0	11.5	25	0.76	98
	Metolachlor II	PES	0.75						
12.	Metolachlor II	PES	2.00	0	10.5	10.4	23	0.69	94
	Atrazine	PES	0.50						
13.	Acetochlor	PPI	2.00	25	9.0	10.3	23	0.68	96
14.	Acetochlor	PES	2.00	0	9.8	11.1	24	0.74	97
15.	Acetochlor	PES	2.00	0	10.0	10.5	22	0.70	97
	Atrazine	PES	0.50						
16.	Acetochlor	PPI	0.93	15	9.3	11.1	25	0.74	94
	Acetochlor	PES	0.67						
29.	Axiom	PES	0.72	3	10.3	11.4	22	0.67	96
27.	Atrazine	PES	1.00	0	9.0	12.0	25	0.79	98
28.	Control:no herbicide			0	9.0	10.8	25	0.71	97
	LSD (P=0.05)			15	2.4	2.1	4.8	0.18	6

Table 7. Tolerance of sweet corn to postemergence herbicides at the vegetable research farm, Corvallis, OR, 1995.

No.	Herbicide	Timing	Rate	Sweet corn yield	No ears	Avg. ear wt	Maturity index
			lbs ai/ac	(t/ac)	(no/15 ft row)	lbs/ear	(100=mature)
17.	Metolachlor II	PES	2.00	11.4	24	0.76	96
	Prosulfuron directed	POST	0.0179				
18.	Metolachlor II	PES	2.00	11.3	24	0.75	98
	Prosulfuron broadcast	POST	0.0179				
19.	Metolachlor II	PES	2.00	11.8	25	0.78	99
	Nicosulfuron directed	POST	0.0310				
20.	Metolachlor II	PES	2.00	8.6	20	0.57	93
	Nicosulfuron broadcast	POST	0.0310				
21.	Metolachlor II	PES	2.00	10.5	21	0.70	98
22.	Dimethenamid	PES	1.20	10.9	23	0.72	96
23.	Dimethenamid	PES	1.20	9.4	21	0.63	91
	Pyridate	EPOST	0.94				
24.	Dimethenamid	PES	1.20	11.1	24	0.73	97
	Pyridate	POST	0.70				
	Atrazine	POST	0.50				
25.	Dimethenamid	PPI	1.20	10.6	23	0.71	90
	Pyridate	EPOST	0.94				
26.	Dimethenamid	PPI	1.20	10.3	23	0.69	95
	Pyridate	POST	0.70				
	Atrazine	POST	0.50				
27.	Atrazine	PES	1.00	12.0	25	0.75	98
28.	Control:no herbicide			10.8	25	0.71	97
30.	Halosulfuron	POST	0.031	10.6	23	0.70	99
	LSD (p=0.05)			2.1	4.8	0.18	6

2. Propane flaming for in-row weed control.

Experiments were placed at the Vegetable research farm in plantings of Jubilee sweet corn. We directed the flame dispensers from both sides of the row at 45 degrees from horizontal and approximately 10 inches from both sides of the row to target weeds growing within the row. Tractor speed was 3 MPH. Flame dispensers were mounted on skids such as used for directed herbicide application equipment to keep the flame at a consistent distance from the ground. 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. Additionally, half of each plot was kept weed free with atrazine and handhoeing to evaluate tolerance of sweet corn to flame intensity. Treatments were applied singly or in multiple applications when the growing tip of the emerging corn leaf was 2,10,16, and 22 inches above the soil. A stale seed bed system was used to encourage weed seed germination before crop emergence in treatments 1 through 6.

Sweet corn tolerance (Table 8). Sweet corn was very tolerant of propane flaming when applied to corn that was 10 or more inches tall. Slight decreases in yield were noted with application rates of 18 gal/acre (40 PSI at the nozzle) when the corn was 22 inches high.

Sweet corn was also tolerant of flaming when the first true leaf of sweet corn was just emerging. Results last year indicated there is little advantage to flaming corn when corn is less than 10 inches tall because weed control potential is very limited and risk of damage to the corn is high. However, flaming at this very early stage would be a great advantage for early emerging and difficult to control weeds such as common purslane. In this trial, sweet corn yields were not reduced when the flame was directed vertically toward the ground at a rate of 9.0 gal/acre (20 PSI at the nozzle at 3 MPH).This essentially burned the first emerging leaf to the ground but did not seem to affect growth or yield. Weed control was greatly improved however, especially for more difficult to kill weeds such as purslane.

Weed control (Table 9). The success of propane flaming to control weeds is very dependent on timing. This trial was designed to look primarily at tolerance, but treatments coincided relatively well with appropriate timing for most efficient weed control. These results indicate that in optimum conditions, and in concerted effort with cultivation to control weeds between rows, propane flaming can be used to effectively control in-row weeds and reduce competition. A single application of propane at 9 gal/A adequately suppressed pigweed but did not adequately control purslane or barnyardgrass. One additional flaming greatly improved weed control, particularly of purslane. Table 10 demonstrates that the weed control contributed by propane flaming can significantly improve yield. Several treatments yielded as well as the weed free control and significantly better than the unweeded treatment that only had in-row cultivation for weed control.

Table 8. Tolerance of sweet corn to propane flaming in weed free conditions.

	Propane timing			Propane rate			Fresh wt.	No. ears	Average ear wt	Culls	Earworm damage
	1	2	3	1	2	3					
	-corn height (in)-			-gal/acre/application-			-t/ac-	-15'/row-	-g-	-%-	-%-
4.	2" 1st leaf			4.5			12.5	32	272	21	16
5.	2" 1st leaf			9.0			12.1	35	239	21	10
6.	2" 1st leaf	10"	16"	9.0	4.5	9.0	12.8	34	251	6	7
7.	10"			4.5			12.6	35	251	21	16
8.	10"			9.0			12.1	34	256	20	15
9.	10"	16"		4.5	9.0		11.9	30	267	17	16
10.	10"	16"	22"	4.5	9.0	13.5	12.0	31	263	17	10
11.	16"			9.0			12.1	34	252	18	16
12.	16"			13.5			11.7	31	263	18	8
13.	16"	22"		9.0	13.5		11.5	30	266	22	18
14.	22"			13.5			11.7	32	253	8	7
15.	22"			18.0			11.1	29	241	17	21
16.	No propane applied						12.0	31	267	10	5
	LSD						2.3	5	24	14	7

Table 9. Impact of propane flaming on in row weed control in sweet corn at 8 WAP.

	Propane timing			Propane rate			Stale seedbed	Pigweed	Purslane	Nightshade	Barnyard grass
	1	2	3	1	2	3					
	-corn height (in)-			-gal/acre/application-				- Percent weed control -			
1.	No propane applied			Control			+	0	0	0	0
2.	before emergence	10"	16"	4.5	4.5	9.0	+	52	58	25	50
3.	before emergence	10"	16	9.0	4.5	9.0	+	100	100	100	100
4.	2" 1st leaf			4.5			+	13	0	8	25
5.	2" 1st leaf			9.0			+	88	69	75	50
6.	2" 1st leaf	10"	16"	9.0	4.5	9.0	+	100	50	100	75
7.	10"			4.5			-	80	30	65	58
8.	10"			9.0			-	93	13	48	17
9.	10"	16"		4.5	9.0		-	98	63	85	75
10.	10"	16"	22"	4.5	9.0	13.5	-	98	66	100	100
11.	16"			9.0			-	65	17	42	38
12.	16"			13.5			-	61	13	61	25
13.	16"	22"		9.0	13.5		-	50	42	63	50
14.	22"			13.5			-	18	14	46	50
15.	22"			18.0			-	62	58	68	40
16.	No propane applied						-	0	0	0	0
	LSD (P=0.05)							30	32	33	32

Table 10. Impact of propane flaming on weed control and sweet corn yield. Propane flaming was the only weed control for the area within the rows. Cultivation was used to control weeds in the row middles to within a 10 inch band of the row.

Propane timing			Propane rate				Sweet corn yield	Weed control estimate		
1	2	3	1	2	3	Total[1]		Pigweed	Purslane	Barnyardgrass
-corn height in inches-			-gal/acre/application-				-t/ac-	-%-	-%-	-%-
2 (1st leaf emerged)			9.0			9.0	12.8	88	69	50
10"			4.5			4.5	12.2	80	30	58
10"			9.0			9.0	12.4	93	13	17
10"	16"		4.5	9.0		13.5	11.4	98	63	75
10"	16"	22"	4.5	9.0	13.5	27.0	11.5	98	66	100
No flaming, weed free			-	-	-	-	12.0	100	100	100
No flaming, unweeded			-	-	-	-	10.0	0	0	0
LSD (P=0.05)							2.3	30	32	32

[1] Cost of propane ranges from $0.75 to $0.99/gallon.

3 & 4. Cover crop residues, reduced tillage, and cross-slot planter performance.

Two trials were located at the vegetable research farm to assess impact of cover crop residues on weed emergence and efficacy of herbicides, and tolerance of sweet corn to cover crop residues. In the **first trial** (Table 12 and 13) four cover crops were planted in October, 1994, killed with glyphosate in April of 1995, and sweet corn planted with a cross-slot planter on May 27, 1995. Cover crops were rolled before planting and one half of each plot flailed. The fallow plot was split and one half was chisel plowed and rototilled to prepare a seedbed. Dimethenamid and metolachlor were broadcast PES perpendicular to the plots with a small area left untreated. Sweet corn was harvested from 15 feet of row within the metolachlor treated area. Though weed control was exceptional in the cover crop plots, handweeding was used to remove any weeds from the area that was to be harvested for sweet corn yield determination.

In the **second trial** (Table 14), four cover crops were planted in October of 1994. Each main plot was split in half; one half was killed with glyphosate in April of 1995 and the other half was flailed in April and May and then chisel plowed and rototilled in June. Sweet corn was planted on 36 inch rows with the cross-slot planter into both the undisturbed cover crop residue and the tilled soil on June 27. Weed evaluations were made 4 weeks after planting.

Weed suppression. Fall planted cereals killed in the spring with corn planted directly into undisturbed soil and cover crop residue reduced weed emergence as much as 95 to 99. Summer annual weed emergence averaged across the cover crop treatments was reduced by 80 percent by eliminating spring tillage (Table 14). Adding the cover crop increased suppression by a maximum of 10 percent compared to untilled winter fallow. Eliminating spring tillage reduced nightshade emergence more than pigweed emergence. Though the difference is modest in these results, previous research suggests this trend. Even at 8 WAP, weed control in the cover crop residue plots was near 60 percent compared to the conventional tillage plot (Table 13). Treatments with a cereal plus a legume generally did not suppress weed as well as treatments without a legume.

Pigweed control with metolachlor was not affected by the cover crop residue with the exception of the *Hesk* barley and common vetch. Pigweed control with dimethenamid in cover crop residues was slightly lower than the conventional tillage plot, especially in the *Micah* barley and common vetch treatment with unflailed residues. These differences were possibly due to the nature of the residue. *Micah* barley was more upright and soil coverage was much less than treatments with a legume.

Common purslane control was greatly improved by the cover crop residues and was near 100 percent in the triticale and crimson clover plot (Table 13). The combination of cover crop residue plus herbicide dramatically improved purslane control compared to the conventional tillage plot. Total weed control was best with metolachlor plus a cover crop residue.

Corn tolerance. Sweet corn yield was usually greatest when the cover crop residues were flailed. 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. Again the upright stature of this variety may have allowed more soil warming and therefore, improved growth. Flailing this cereal dramatically increased soil coverage and corn growth. This growth advantage did translate into a yield increase at seasons end compared to the flailed plot.

Overall yields in this plot were exceptional. Corn was planted at a slightly higher density to ensure adequate stands. However, emergence was very similar across treatments and plants were not thinned. The cross slot planter was used in this trial and performed well. Some residues were more difficult to plant into than others, particularly those with common vetch that formed a mat and kept the soil wet. Otherwise, planting went well, even when applying 80 gal/acre of 10-34-0 at planting. The cross-slot planter bands fertilizer approximately one inch from the seed.

Table 11. Weed control and sweet corn yield as influenced by tillage, cover crop residue, and cover crop management in weed free plots.

Treatment (cover crop and tillage regime)	Management	Sweet corn yield -t/ac-	No. ears/15 ft of row	Maturity index	Cover crop biomass	
				%	Tons/ acre	Ratio legume/cereal
Barley	Flailed	10.3	28	88	1.6	-
	Unflailed	13.4	29	93		
Barley + c.vetch	Flailed	13.9	32	95	2.6	.14
	Unflailed	11.3	24	90		
Triticale and C. clover	Flailed	11.8	27	94	2.0	.1
	Unflailed	10.1	27	86		
Hesk barley and c. vetch	Flailed	13.2	33	90	2.2	.26
	Unflailed	14.1	33	90		
Fallow : untilled	-	13.1	33	100	0.9	-
Chisel plow + rotara	-	13.6	30	95	0.9	-
LSD (P=0.05)		2.8	NS	NS	-	-

Table 12. Cover crop, tillage and herbicide effects on weed emergence.

Treatment	Management	Herbicide	Pigweed	Common purslane - % control - (8 WAP)	Total
1 Micah barley	unflailed	dimethenamid	83	98	75
		metolachlor	94	95	90
		none	58	97	64
	flailed	dimethenamid	89	83	76
		metolachlor	94	95	78
		none	59	63	46
2 Micah barley + c. vetch	unflailed	dimethenamid	55	100	74
		metolachlor	90	98	86
		none	38	50	43
	flailed	dimethenamid	74	75	70
		metolachlor	94	85	90
		none	43	60	48
3 Triticale + crimson clover	unflailed	dimethenamid	93	95	86
		metolachlor	93	98	91
	flailed	none	66	100	70
		dimethenamid	80	96	70
		metolachlor	90	100	79
		none	58	99	61
4 Hesk barley + c. vetch	unflailed	dimethenamid	81	73	75
		metolachlor	80	96	76
		none	59	80	58
	flailed	dimethenamid	80	78	75
		metolachlor	71	83	75
		none	41	63	36
5 Fallow	Untilled	dimethenamid	86	59	75
		metolachlor	93	85	89
		none	18	38	20
6 Fallow	Tilled	dimethenamid	100	50	68
		metolachlor	86	43	65
		none	0	0	0
LSD (P=0.05)			41	36	31

Table 14. Cover crop and tillage effects on broadleaf weed emergence in sweet corn

Cover crop treatment	Spring tillage	Pigweed -no/m^2-	Nightshade -no/m^2-	Total broadleaf weeds -no/m^2-
1. Micah barley	-	9 *	1 *	11 *
2. Micah barley	+	106	33	143
3. Wheeler rye	-	23 *	0 *	25 *
4. Wheeler rye	+	80	69	149
5. Monida oat	-	15 *	0 *	16 *
6. Monida oat	+	85	96 *	194
7. Winter fallow, no cover crop	-	21 *	7 *	31 *
8. Winter fallow, no cover crop	+	79	51	154

[1] Untilled with minimal disturbance at planting designated by '-'; tillage (chisel plow + rotara is designated by '+')):
[2] Means in the same column followed by an asterisk differ significantly from treatment 8 (no cover crop and tilled soil) p=0.05.