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

Title: **Vegetation Management in Sweet Corn**

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Project Status: Yearly
Project funding: $12,850 (1 year)

Objectives

1. Evaluate *Surpass* (acetochlor), *Frontier* (dimethenamid), *Tough* (pyridate), and *Accent* (nicosulfuron), for weed control and crop tolerance, and develop appropriate weed control programs to minimize impact of atrazine tolerant weeds and proso millet.
2. Determine tolerance of sweet corn to propane flaming with emphasis on early postemergence applications.
3. Determine impact of cover crop residues on weed emergence, herbicide efficacy, and sweet corn growth in both minimum tillage and conventional tillage systems.
4. Evaluate a novel four-row planter design for planting in conventional tillage and no-till environments in several different cover crop residues.

Progress

1.1. Sweet corn tolerance to herbicides (Table 1)

Tolerance of *Super Sweet Jubilee* and *Golden Jubilee* sweet corn to herbicides was evaluated at the Vegetable Research Farm at Corvallis. Dyfonate was preplant incorporated at this site and sweet corn planted on June 3. Corn seedlings were thinned to nearly equal stands after the initial emergence evaluation, and weed competition minimized with cultivation and hand hoeing thereafter.

Frontier injury was greatest when applied PPI, a trend that has been evident the last three years but with some exceptions. *Surpass* was less likely to injure sweet corn than *Frontier*. Injury was seldom noted with *Dual II*. *Accent* 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. *Tough* injury was usually visible just after application but did not significantly reduce yield. *Tough* plus *Accent* plus atrazine significantly injured sweet corn early in the season and caused a few multiple ears to form, but did not reduce yield.

1.2. Wild proso millet (WPM) control in sweet corn (Table 2)

A site was selected near Stayton with a very uniform population of WPM. Insecticides were not used in this trial. Sweet corn was planted on May 30 and growers and field representatives participated in evaluation.

Surpass controlled WPM better than *Frontier*, and *Frontier* controlled WPM better than *Dual*. Treatments with good preemergence WPM control included *Eradicane* PPI plus *Surpass/Frontier*. At harvest, *Eradicane* PPI plus *Surpass* controlled WPM as well as *Accent*. *Accent* alone suppressed WPM, but control was not complete at harvest unless in combination with another herbicide.

1.3. Atrazine tolerant pigweed control in sweet corn (Table 3)

Sweet corn was planted June 9 on a well drained sandy loam soil with relatively low organic matter content and low cation exchange capacity. Pigweed was moderately tolerant of atrazine at this site. Insecticides were not applied.

Frontier plus atrazine completely controlled pigweed throughout the season even though a moderate level of atrazine tolerance was noted. *Dual* plus atrazine controlled 95 percent of the pigweed. *Frontier* alone controlled pigweed better than *Dual* whether PPI, PES or as a split application. *Surpass* however, was the most effective of the chloroacetimides *Dual* and *Frontier*.

The most effective pigweed treatment at harvest was *Surpass* (PES) + *Accent* (POST). *Peak* (prosulfuron) or *Battalion* (halosulfuron) applied postemergence after *Dual* significantly improved pigweed control. *Accent* controlled pigweed very well. Applying *Tough* with *Accent* did not improve pigweed control at this site compared to *Accent* alone, but may broaden the spectrum to weeds such as lambsquarter. *Battalion* and *Peak* will probably need to applied as directed treatments to minimize injury. *Battalion* can also be applied preemergence with little risk of injury. *Tough* must be applied before corn exceeds 10 inches.

2.1. Tolerance of sweet corn to propane flaming (Tables 4 & 5)

Golden Jubilee sweet corn was planted at the Vegetable Research Farm in 45 by 10 ft plots with four replications. Atrazine was applied to half of each plot to minimize the effect of weed competition on the yield of propane flamed sweet corn.

Propane was applied at 10 and 20 PSI at three stages: 1) > 50 % cotyledon leaves showing; 2) cotyledon plus one true leaf; and 3) at two true leaves. Corn growth at 4 weeks after planting 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 the third flaming. 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. Pigweed and purslane control averaged nearly 60 and 95 percent, respectively if the soil was flamed just as the corn was emerging (Trs. 1 and 2).

3.1. Cover crop and tillage impacts on weeds and sweet corn growth (Table 6)

Cover crops were planted in the fall of 1995, and killed in April of 1996. Treatments included flailed or unflailed cover crops, winter fallow with no cover crop, and one treatment plowed and rototilled.

Corn yield in this experiment was moderate to poor on average, and very low on one side of the field that was under water during the flood in February. Corn emergence was similar across treatments, but generally improved if the cover crop residue was flailed before planting. Corn growth was much more vigorous if the soil was plowed, and sweet corn in the plowed treatment yielded higher than all other treatments except the unflailed *Micah* barley. Average ear weight was also highest in the plowed treatment. Flailing the cover crop residue had little impact on sweet corn yield, with one exception. Flailing the *Micah* barley treatment significantly reduced yield. The upright and short stature of this spring barley and partial winter-kill removed many leaves and may have allowed more soil warming, therefore improving corn growth. Flailing this cereal residue increased soil coverage and decreased corn growth. Treatments with common vetch tended to form a mat on the soil surface.

Triticale plus crimson clover and the *Micah* barley residue controlled weeds best. Cover crops with a legume did not suppress weeds as well as cereal cover crops alone. Dual or Frontier applied over cover crop residues completely controlled most weeds and was a significant improvement compared to the same herbicides applied over conventionally tilled soil.

4.1. Cross-slot planter performance

A four-row cross-slot planter was tested for direct seeding of snap beans, corn, and squash into undisturbed soil and cover crop residues. This planter performed well when planting into untilled soil but tended to 'plow' in the tilled soil because of uneven down-pressure among the four openers. The best success has been with squash and snap beans. Sweet corn growth and yield was much better in 1995 than this year in the same treatments. Fertilizer rates were nearly the same in the two years but in 1995 nearly all of the nitrogen and phosphorus were applied at planting. Uneven seed depth placement is a concern with these openers and may contribute to the difficulty of growing sweet corn in untilled soil.

Summary

Frontier PPI reduced sweet corn yield. Injury from *Accent* was more common this year than last, and reduced yields whether directed or broadcast. The broadcast application of *Accent* did minimize damage to the corn ears. Stress initiated by a very hot period just after application in this trial may have exacerbated injury to the corn. Careful attention to irrigation may be essential if *Accent* is applied later in the season.

Surpass PES plus *Eradicane* PPI/*Accent* POST controlled wild proso millet very well but cost approximately $40 and $50/acre, respectively. *Accent* must be used in conjunction with other strategies or herbicides to obtain full season proso millet control. *Frontier* controls many broadleaves better than *Dual*; an exception is very poor lambsquarter control. *Tough, Battalion*

and *Peak* are postemergence herbicides that will improve triazine tolerant broadleaf control with *Dual* or *Frontier* if registered.

Propane flaming sweet corn just as it was emerging may have reduced yield but the results were inconsistent. Flaming at the two leaf stage significantly reduced sweet corn yield.

The yield of sweet corn planted into undisturbed cover crop residue was comparable to yield of corn planted into plowed and rototilled soil, but only in one of four cover crop treatments. Flailing the residue did not improve corn yield and even decreased it in the barley only cover crop treatment.

Table 1. *Jubilee* sweet corn tolerance to selected herbicide treatments, Vegetable Research Farm.

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. Metolachlor II Prosulfuron (broadcast)	PES POST	2.0 0.0179	3	16	7.0 a	10	8	10
14. Metolachlor II Prosulfuron (directed)	PES POSTD	2.0 0.0179	2	19	8.1a	10	9	9
15. Atrazine	PES	1.0	2	19	8.2	10	7	10
16. 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.

Table 2. Proso millet control in sweet corn. Selected treatments from the trial at Stayton.

Herbicide	Timing	Rate	Proso millet emergence (3 WAP)	Millet seed culm weight (harvest)	Grower evaluation of growth and weed control (5 WAP)
		lb/A	no./11 ft^2		5 = excellent; 1= unacceptable
1. Frontier	PPI	1.2	15	-	1.1
2. Frontier	PES	1.2	11	-	1.2
3. Frontier[1]	PES	1.2	6	-	2.6
Atrazine		1.3			
4. Dual II	PPI	2.00	20	-	1.1
5. Dual II	PES	2.00	49	-	1.0
6. Dual II	PPI	2.00	1	-	2.7
Dual II	PES	2.00			
7. Dual II[2]	PES	2.0	41	-	1.0
Atrazine	PES	1.1			
8. Dual II	PPI	2	2	30 (3)[3]	4.1
Frontier	PES	1.2			
9. Surpass	PPI	2	2	-	3.6
10. Surpass	PES	2	1	69 (2)	3.6
11. Surpass	PES	2.0	NA[4]	0 (3)	4.9
Accent	EPOST	0.031			
12. Surpass	PES	2.0	0	8 (4)	4.5
Eradicane	PPI				
13. Frontier	PES	1.2	1	58 (2)	3.8
Eradicane	PPI	4.2			
14. Dual II	PES	2.0	5	55 (3)	3.5
Eradicane	PPI	4.2			
15. FOE 5043[5]	PES	16 oz	11	-	3.1
Sencor					
16. FOE 5043	PES	18 oz	9	-	2.5
Sencor					
17. Prowl	PES	1.5	8	-	3.0
Atrazine	PES	0.5			
18. Check	-	-	21	-	0.9
FPLSD (0.05)			33		

[1] Frontier + atrazine = Guardsman
[2] Dual II + atrazine = Bicep II
[3] Number in ( ) is number of plots of this treatment (from total of 4) that suppressed millet growth comparable to the growers treatment at harvest.
[4] Accent not applied at this point in time.
[5] FOE 5043 + Sencor = Axiom

Table 3. Preplant incorporated and premergence pigweed control 4 WAP. Selected treatments from the site at Monroe.

Herbicide	Timing	Rate	Pigweed	
			4 WAP	Harvest
		lbs ai/ac	% control	
1. Frontier	PPI	0.94	80	73
2. Frontier	PES	0.94	100	99
3. Frontier[1]	PES	0.94	98	100
Atrazine		1.06		
4. Dual II	PPI	1.46	60	43
5. Dual II	PES	1.46	71	61
6. Dual II [2]	PES	1.46	91	95
Atrazine	PES	1.18		
7. Surpass	PPI	1.25	93	85
8. Surpass	PES	1.25	95	92
9. Surpass	PES	1.25	86	75
Atrazine	PES	1.18		
10. FOE 5043[3]	PES	13 oz/acre[4]	79	53
Metribuzin				
11. FOE 5043	PES	15 oz acre	80	65
Metribuzin				
12. Atrazine	PES	1.18	53	51
13. Check	-	-	0	0
FPLSD (0.05)			19	26

[1] Frontier + atrazine = Guardsman
[2] Dual II + atrazine = Bicep
[3] FOE 5043 + Sencor = Axiom
[4] FOE 5043 +metribuzin applied at 13 or 15 oz of product/ac.

Table 4. 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
LSD (0.05)			22	ns	ns

Table 5. Effect of propane flaming on sweet corn yield.

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

[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 6. Sweet corn yield response to cover crop residue and tillage.

Cover crop treatment		Emergence	No ears harvested	Avg. ear wt	Ear yield
		no./3 ft	no./16.6 ft	gr.	t/ac
1. Micah barley	flailed	10.3	16.3	407.5	7.7
	unflailed	9.0	19.3	401.3	9.0
2. Micah barley & common vetch	flailed	12.0	15.0	419.0	7.4
	unflailed	10.8	14.8	411.0	7.2
3. Hesk barley & common vetch	flailed	12.5	15.8	429.8	6.3
	unflailed	9.5	13.0	407.5	6.2
4. Triticale & cr. clover	flailed	11.3	15.8	423.0	7.7
	unflailed	9.3	16.3	415.0	7.9
5. Fallow	flailed	11.0	16.5	407.5	7.9
	unflailed	11.0	16.5	392.3	7.6
6. Fallow plus tillage	tilled	9.8	17.1	450.7	9.0
FPLSD(0.05)		ns	ns	ns	ns

Signatures

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