

Row Middle Weed Management

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Summary

Herbicides for row middles were evaluated at four sites. All herbicide treatments tended to reduce weed numbers. Application following transplant establishment was more effective than application prior to transplant. Flumioxazin, oxyfluorfen or tank mixes containing these products were the most effective. Future work will determine the most effective herbicide program for row middles in strawberry fields.

Methods

Research Center Trials. A variety of registered and non-registered herbicides (Table 1) were applied to strawberry row middles on October 4-5, 2016, at GCREC and at the FSGA research farm in Dover. Plots were 25 feet on each side of a bed and each plot was replicated four times. Herbicides were applied using a hand-held CO₂ pressurized sprayer in 20 GPA of water at 35 psi. We used a Teejet 8002 EVS nozzle. Strawberry (cv. Florida Radiance) transplants were planted 6 days later. We evaluated crop damage, conducted multiple weed counts, and measured crop yield.

On-Farm Trials. Multiple registered herbicides (Table 2) were applied to strawberry row middles on two commercial strawberry farms immediately before transplant or after the overhead irrigation was turned off following transplant. Plots were 100 feet of a single row middle and each plot was replicated four times. Herbicides were applied using a hand-held CO₂ pressurized sprayer in 20 GPA of water at 35 psi. We used a Teejet 8002 EVS nozzle. Crop management was done by the grower. We conducted multiple

weed counts over time and collected soil samples to measure herbicide persistence.

Results

Research Center Trials. Two weeks after herbicide application at Balm, tank mixes of oxyfluorfen (Goal 2XL) + pendimethalin (Satellite Hydrocap) or flumioxazin (Chateau) + pendimethalin (Satellite Hydrocap) tended to be the most effective, although the difference was not significant and there were no treatment differences at 7 weeks after application (WAA) (Table 3). At Dover, the best herbicide options were flumioxazin (Chateau) or flumioxazin (Chateau) + pendimethalin (Satellite Hydrocap) or S-metolachlor (Dual Magnum) at 7 weeks after treatment (Figure 1).



No herbicide

Chateau

Figure 1. Weeds in the row middles where no herbicide was applied or Chateau (flumioxazin) was applied.

On-Farm Trials. Weed densities were low on all on-farm trials. This was likely due to very dry conditions throughout the experimental period. No consistent differences were observed between herbicide treatments. Weed control was consistently better when the herbicides were applied after the overhead irrigation was turned off.

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Table 1. Herbicide treatments applied to strawberry row middles at the Gulf Coast Research and Education Center in Balm, Florida, and at the Florida Strawberry Growers Association in Dover, FL, in October 2016.

Common name	Trade name	Rate --oz acre ⁻¹ --	Rate --g ai ha ⁻¹ --
Nontreated control	Nontreated control	-	-
Lactofen	Cobra® Herbicide	32	560
Flumioxazin + pyroxasulfone	Fierce® Herbicide	3	70 + 89
Flumioxazin	Chateau® Herbicide SW	3	107
Oxyfluorfen	Goal® 2XL	32	560
Pendimethalin	Satellite® Herbicide	48	1596
Napropamide	Devrinol 2XT	256	8965
Acifluorfen	Ultra Blazer® Herbicide	24	420
Flumioxazin + pendimethalin	Chateau + Satellite	3 + 48	107 + 1596
Flumioxazin + S-metolachlor	Chateau + Dual	3 + 16	107 + 1067
Acifluorfen + S-metolachlor	Ultra Blazer + Dual	24 + 16	420 + 1067
Oxyfluorfen + pendimethalin	Goal + Satellite	32 + 48	560 + 1596

Table 2. Herbicide treatments applied to row middles in field experiments conducted on two commercial strawberry farms in Plant City, FL.

Timing	Common name	Product name	Rate --oz/acre--	Rate --g ai/ha--
PT	Nontreated	Nontreated	-	-
	Flumioxazin	Chateau	3	107
	Oxyfluorfen	Goal	32	560
	Pendimethalin	Satellite	48	1596
	Napropamide	Devrinol 2XT	256	8964
AI	Flumioxazin	Chateau	3	107
	Oxyfluorfen	Goal	32	560
	Pendimethalin	Satellite	48	1596
	Napropamide	Devrinol 2XT	256	8964
	Nontreated	Nontreated	-	-

Abbreviations: PT, applied prior to transplant; AI, applied after the overhead irrigation is turned off.

Table 3. Weed counts in row middles after herbicide applications in field experiments conducted in Balm and Dover, Florida.¹

Date ²	Herbicide	Rate	Balm	Dover
			-----weed m ⁻² -----	
2 WAT	Nontreated control	-	121ab ⁴	82
	Lactofen	560	34b	1
	Flumioxazin + pyroxasulfone	70 + 89	141ab	0
	Flumioxazin	107	34b	0
	Oxyfluorfen	560	23b	0
	Pendimethalin	1596	39b	125
	Napropamide	8965	111ab	29
	Acifluorfen	420	261a	28
	Flumioxazin + pendimethalin	107 + 1596	10b	0
	Flumioxazin + S-metolachlor	107 + 1067	13b	0
	Acifluorfen + S-metolachlor	420 + 1067	49b	0
	Oxyfluorfen + pendimethalin	560 + 1596	17b	0
	p-value		0.0346	0.3514
5 WAT	Nontreated control	-	.	17cd
	Lactofen	560	.	51a
	Flumioxazin + pyroxasulfone	70 + 89	.	31abc
	Flumioxazin	107	.	4d
	Oxyfluorfen	560	.	4d
	Pendimethalin	1596	.	26bcd
	Napropamide	8965	.	31abc
	Acifluorfen	420	.	41ab
	Flumioxazin + pendimethalin	107 + 1596	.	10cd
	Flumioxazin + S-metolachlor	107 + 1067	.	4d
	Acifluorfen + S-metolachlor	420 + 1067	.	21bcd
	Oxyfluorfen + pendimethalin	560 + 1596	.	11cd
	p-value		.	0.0066
7 WAT	Nontreated control	-	130	17cd
	Lactofen	560	205	51a
	Flumioxazin + pyroxasulfone	70 + 89	384	31abc
	Flumioxazin	107	53	4d
	Oxyfluorfen	560	71	4d
	Pendimethalin	1596	106	26bcd
	Napropamide	8965	192	31abc
	Acifluorfen	420	219	41ab
	Flumioxazin + pendimethalin	107 + 1596	49	10cd
	Flumioxazin + S-metolachlor	107 + 1067	212	5d
	Acifluorfen + S-metolachlor	420 + 1067	148	21bcd
	Oxyfluorfen + pendimethalin	560 + 1596	40	11cd
	p-value		0.1738	0.0006

¹Initial herbicide treatments were made on October 4, 2016 and October 5, 2016 in Balm and Dover, respectively. A 840 g ai ha⁻¹ paraquat was added to the initial herbicide treatments to burndown emerged weeds. Sequential treatments were applied at 5 WAT.

²Weeds were counted on October 19, 2016, November 10, 2016, November 23, 2016, and December 1, 2016.

³Total weed includes all weed species.

⁴Means within species followed by different letters are significantly different at $p < 0.05$.

⁵Dots indicate data were not collected. Dishes indicate weed density was < 0.1 no m^{-2} .

Abbreviations: WAT, weeks after treatment.

Table 4. Weed counts in row middles in field experiments conducted on two commercial strawberry farms in Plant City, FL.¹

Herbicide	Rate	Farm 1			Farm 2		
		November 15, 2016	November 29, 2016	December 28, 2016	November 15, 2016	November 23, 2016	January 3, 2017
	--g ai/ha-	----- weed m^{-2} -----					
Nontreated	-	0.2a ²	1.7a	1.1a	13.6	77.9a	1.1a
Flumioxazin	107	0b	0.3ab	0.3ab	2.1	6.5b	0.1ab
Oxyfluorfen	560	0b	0.2b	0.1b	0.3	81.4ab	0b
Pendimethalin	1596	0b	0.2b	0.1b	0.1	2b	0.1ab
Napropamide	8964	0.1b	0.7ab	0.6ab	9.6	144.1a	0.2ab
Timing							
PT		0.1	1.1a	0.6a	6.9	99.7a	0.5
AI		0.02	0.2b	0.2b	3.5	25.0b	0.2
Herbicide		0.0408	0.0253	0.0192	0.0372	0.0133	0.0323
Timing		0.0742	0.0173	0.0284	0.2713	0.0093	0.2678
Herbicide x timing		0.6128	0.5709	0.3727	0.2238	0.0122	0.5274

¹Weed counts included broadleaf and grass weeds.

²Means within dates followed by different letters are significantly different at $p < 0.05$.

Abbreviations: PT, applied prior to transplant; AI, applied after the overhead irrigation is turned off.