

UPDATE

10792 Pyroxasulfone

Weed Control in Peppermint

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Five studies were conducted in western Oregon by the OSU Weed Science Program in 2010. Results from these studies are discussed below. For more detailed information regarding currently labeled herbicide applications, weed control efficacy and crop rotation restrictions associated with herbicide applications always refer to specific herbicide labels, the Weed Management in Mint Extension Publication (EM8774, Revised 2008, <http://extension.oregonstate.edu/catalog/index.php>) and to the Mint Chapter in the 2011 Pacific Northwest Weed Management Handbook (<http://pnwpest.org/pnw/weeds>).

Summer Annual Broadleaf Weed Control in Baby Peppermint

Two experimental herbicides, saflufenacil (Sharpen) and pyroxasulfone (KIH-485), were applied early post-emergence

to the peppermint and pre-emergence to the weeds. Saflufenacil is a burndown product with limited soil residual properties, while pyroxasulfone has pre-emergence activity. Post-emergence applications of ethofumesate (Nortron), MCPB (Thistrol), MCPB + bentazon (Basagran) and MCPB + carfentrazone (Aim) were also evaluated on actively growing peppermint for crop safety. MCPB may broaden the weed control spectrum of herbicides such as bentazon and carfentrazone in non-dormant peppermint.

Saflufenacil was applied at two rates in January to evaluate rates for residual control of summer annual broadleaf weeds. Pyroxasulfone also was applied at two rates to evaluate potential use rates. The MCPB applied alone and the MCPB tank mix combinations were applied in May to actively growing peppermint and post-emergence to the weeds. Visual evaluations of crop injury and weed efficacy were conducted and the peppermint was hand harvested August

Table 1. Summer Annual Broadleaf Weed Control in Baby Peppermint

Treatment	Rate lb ai/a	Appl code	-----%-----				lb/2 yd ²	lb/A
check	0		0	0	0	0	16	76
saflufenacil X	0.016	A	0	0	0	0	15	62
saflufenacil	0.034	A	0	0	0	0	18	77
pyroxasulfone 10792	0.092	B	0	73	83	93	18	61
pyroxasulfone	0.184	B	0	98	100	100	18	86
MCPB	0.5	C	0	*	*	*	15	71
MCPB + bentazon	0.375 0.75	C	0	*	*	*	16	58
MCPB + carfentrazone	0.375 0.012	C	10	*	*	*	18	79
ethofumesate	1.5	C	0	*	*	*	18	77
LSD (P=0.05)							ns	ns
CV							20	21

A - Applied January 26, 2010; 5% emerged peppermint

B - Applied March 4, 2010; 20% emerged peppermint

C - Applied May 10, 2010; 10% emerged peppermint

Table 2. Comparison of Pyroxasulfone and Terbacil for Weed Control in Dormant Established Peppermint

Treatment	Rate	Appl code	%	-----% Control -----					lb/ 2 yd ²	lb/A
	lb ai/A									
check	0		0	0	0	0	0	0	10 b	10.08
terbacil WP	0.8	A	0	100	100	90	0	100	13 a	12.93
terbacil WDG	0.8	A	0	100	100	93	0	100	11 ab	11.90
pyroxasulfone 0.092	0.092	A	2.5	100	100	90	95	100	9 bc	11.88
pyroxasulfone 0.184	0.184	A	2.5	100	100	95	95	100	7 c	10.6
LSD (P=0.05)									2.4	ns
CV									16	30

Means followed by the same letter do not significantly differ (P=0.05, Duncan's New MRT)

A - Applied March 4, 2010; peppermint emerged 10%

23, 2010 (Table 1). It was not possible to evaluate weed control efficacy for the post-emergence applications as the plots were accidentally hand weeded by a farm crew. The biomass of two square yards of each plot was weighted, air dried and distilled.

MCPB + carfentrazone was the only treatment which caused injury (10 percent) to the peppermint. There was no statistical difference in yield between treatments.

Comparison of Pyroxasulfone and Terbacil for Weed Control in Dormant Established Peppermint

Terbacil (Sinbar) WDG (a new formulation), terbacil WP (the older standard formulation) and two rates of pyroxasulfone were applied early post-emergence to the peppermint for control of summer annual broadleaf weeds. Clethodim (Select) was applied over the study area on April 12, 2010 to reduce competition from the seedling grass weeds.

There were no differences between the newer and older formulations of terbacil for crop safety or weed control (Table 2). Two rates of pyroxasulfone were evaluated and both rates caused five percent injury to the crop. Except for common groundsel, weed control was similar with all of the treatments. Terbacil provided no control of the common groundsel at this site while both rates of pyroxasulfone provided control. Peppermint was hand harvested July 1, 2010. The biomass of two square yards of each plot was weighed, air dried and distilled. The study was established in a field that had roots dug out of it so the mint stand was thin resulting in low overall yields.

Pyroxasulfone, Carfentrazone and MCPB Based Tank Mix Combinations for Summer Annual Broadleaf Weed Control

MCPB broadens the weed control spectrum of herbicides such as bentazon (Basagran) and bromoxynil (Buctril, etc.) in non-dormant mint. Our preliminary research indicates MCPB-based

tank mix treatments and MCPB applied alone are safe on non-dormant peppermint.

A study was established in a commercial field of established peppermint with a history of pigweed populations to evaluate efficacy on summer annual broadleaf weeds of MCPB tank mix combinations. The study was in a competitive peppermint stand and no weeds emerged in the study area, therefore, only crop injury ratings were taken. All of the treatments were applied post-emergence to the peppermint.

Pyroxasulfone was applied in April post-emergence to the peppermint and pre-emergence to weeds. Carfentrazone was applied in May and June to evaluate potential use timings. MCPB and MCPB based tank mix combinations were applied in June. Visual evaluations of crop injury were conducted and the mint was hand harvested in August. The biomass of two square yards of each plot was weighed, air dried and distilled.

The earlier timing of the carfentrazone caused more visible injury (20 percent) two weeks after treatment than the later timing which caused 10 percent injury one week after treatment (Table 3). The peppermint did recover from the injury. All of the MCPB treatments caused some injury to the peppermint due to the late timing of the application. The MCPB + carfentrazone was the most injurious of all of the MCPB combinations. There were differences in fresh weight yields, but not in the oil yields.

Summer Annual Weed Control with Peppermint Herbicides

Registered herbicides and herbicides with potential for use in peppermint were compared for their effectiveness on the summer annual weed species. Pigweed and common groundsel seeds were broadcast into the study area followed by application of five pre-emergence herbicides at various rates, which were incorporated later the same day by a rain event. Natural background populations of sharpshoot fluellin and prickly lettuce were present in the

study area, so control ratings were taken for these two weed species as well.

Two rates of pyroxasulfone and three rates of ethofumesate were compared to two rates of each of the formulations of terbacil, the older WP formulation and the new WDG formulation, pendimethalin (Prowl H₂O) and trifluralin (Treflan) for weed control efficacy.

Terbacil treatments provided good control of all of the weed species except for the common groundsel (Table 4). As the rate of terbacil increased the percent weed control increased. A high rate of pyroxasulfone provided the best control of the weed species except sharpshoot fluvellin. The high rate of pyroxasulfone provided 87 percent control of sharpshoot fluvellin eight weeks after application, but by August it was no longer controlling

Table 3. Pyroxasulfone, Carfentrazone and MCPB Tank Mix Combinations for Summer Annual Broadleaf Control

Treatment	Rate lb ai/A	Appl. code	-----%-----			lb/2 yd ²	lb/A
check	0		0	0	0	19	39 b
pyroxasulfone 10792	0.184	A	0	0	0	22	57 ab
carfentrazone	0.015	B	20	0	0	24	67 a
carfentrazone 9427	0.015	C		10	5	21	58 ab
MCPB	0.5	C		5	0	24	67 a
MCPB + carfentrazone	0.375 0.012	C		10	5	26	65 a
MCPB + bromoxynil	0.375 0.25	C		5	0	25	64 a
MCPB + bentazon	0.375 0.75	C		5	0	24	55 ab
LSD (P=0.05)						ns	22
CV						18	25

Means followed by the same letter do not significantly differ (p = 0.05, Duncan's New MRT)

A - Applied April 21, 2010; 3 inch peppermint

B - Applied May 13, 2010; 8 inch peppermint

C - Applied June 14, 2010; 20 inch peppermint

Table 4. Evaluation of Summer Annual Weed Control with Peppermint Herbicides

Treatment	Rate lb ai/a	Appl code	-----% Control-----							
check	0		0	0	0	0	0	0	0	0
terbacil WP	0.5	A	100	0	83	100	83	0	50	100
terbacil WP	1.0	A	100	0	98	100	100	0	95	100
terbacil WDG	5.0	A	100	0	78	100	83	0	60	100
terbacil WDG	1.0	A	98	0	94	110	95	0	90	100
pyroxasulfone	0.092	A	100	50	28	98	100	50	0	95
pyroxasulfone	0.184	A	100	50	75	100	100	73	0	98
ethofumesate	0.5	A	95	0	0	0	88	0	0	0
ethofumesate	1.0	A	100	0	20	0	90	0	0	0
ethofumesate	1.5	A	100	0	65	5	98	0	18	0
pendimethalin	0.95	A	20	0	10	0	0	0	0	0
trifluralin	0.625	A	85	0	5	0	63	0	0	0

A - Applied May 25, 2010; pre-emergence

Table 5. Evaluation of Herbicides for Crop Safety and Pigweed Control in Double Cut Peppermint

Treatment	Rate lb ai/a	Application code	-----%-----				lb/2 yd ²	lb/A
check	0		0	0	0	0	11 a	34
pyroxasulfone 10792	0.09	A	0	100	0	98	11 a	44
pyroxasulfone	0.184	A	0	95	0	95	9 ab	40
flufenacet-metribuzin	0.425	A	38	90	5	85	8 ab	33
terbacil WP	1.2	A	0	88	0	95	10 ab	37
terbacil WDG	1.2	A	0	95	0	95	10 ab	35
X - saflufenacil	0.044	A	0	0	0	0	10 ab	35
diuron	0.8	A	3	88	0	95	11 a	43
oxyfluorfen	0.5	A	0	100	0	85	9 ab	33
ethofumesate	1.5	A	0	95	0	95	10 a	40
carfentrazone 9427	0.015	B	20	80	10	0	6 b	28
LSD (P=0.05)								ns
CV							23	28

Means followed by the same letter do not significantly differ ($p=0.05$, Duncan's New MRT)

A - Applied July 13, 2010; preemergence

B - Applied August 9, 2010; 8 inch

this species. Pyroxasulfone was the only treatment that provided some control of the common groundsel. The high rate of the two formulations of terbacil, both rates of pyroxasulfone and a high rate of ethofumesate provided at least 95 percent control of pigweed. Trifluralin and pendimethalin controlled pigweed immediately following application, but failed to control later emerging pigweed over the duration of the study. Neither trifluralin nor pendimethalin controlled the other weed species present in this trial.

Evaluation of Herbicides for Crop Safety and Pigweed Control in Double Cut Peppermint

A study was established in a cooperating grower's field that had been swathed July 1 and chopped and removed July 7. On July 13 the pre-emergence herbicides, pyroxasulfone, flufenacet-metribuzin (Axiom), the two formulations of terbacil, saflufenacil, diuron (Karmex), oxyfluorfen (Goal) and ethofumesate, were applied and the study area irrigated. Twenty seven days later carfentrazone was applied to actively growing peppermint and pigweed.

Carfentrazone injured the peppermint and initially injured the pigweed (Table 5). The carfentrazone treatment resulted in 20 percent injury seven days after treatment. The injury declined to 10 percent at 21 days after treatment. The carfentrazone treatment provided 80 percent control of the pigweed seven days after treatment, but by 21 days after treatment the pigweed had regrown resulting in zero percent control. Pyroxasulfone, terbacil, diuron and ethofumesate all

provided at least 95 percent control of the pigweed with no injury to the peppermint. The peppermint was hand harvested September 7, 2010. The biomass of two square yards of each plot was weighed, air dried and distilled. There were differences in fresh weight yields but no differences in the oil yields.

2010 Herbicide Evaluation Summary

Pyroxasulfone has good crop safety on dormant and double cut peppermint and is effective on a wide range of grass and broadleaf species. This compound appears to have potential as a peppermint herbicide and we will continue to experiment with it under a variety of use scenarios to further refine application dates and rates. Saflufenacil is safe on dormant and double cut peppermint, but had poor activity on weeds at the rates we applied in 2010. We will continue to experiment with this herbicide and explore higher application rates to maximize soil residual activity in peppermint production scenarios. Carfentrazone will injure peppermint when applied late post-emergence, however, the peppermint recovers. Carfentrazone applied early and to small weeds, similar to the current use pattern of paraquat in peppermint, may be the best use scenario for this herbicide. Ethofumesate has a unique weed control spectrum and is safe on actively growing peppermint. We will continue to characterize this weed control spectrum to determine if this compound has a fit in peppermint production and adds value in terms of weed control for peppermint growers. There were no differences in weed control efficacy between the terbacil formulations used in 2010.