

Evaluation of Sulfentrazone, Oxyfluorfen and S-Metolachlor in Brassica Vegetables.

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Small acreage Brassica vegetables need additional herbicide options. Among the vegetables grown in California are a number of niche crops such as Bok choy and Brussels sprouts that have a limited number of registered herbicides such as DCPA (Dacthal, Anonymous 2019a).

Sulfentrazone (Zeus) now has a food use tolerance for use on Brassica head and stem group 5-16, which includes crops such as Bok choy and Brussels sprouts as well as Brassica leafy greens subgroup 4-16B, which includes crops such as kale (USEPA 2017; USEPA 2018). However, there is a lack of data for Zeus on a wide variety of Brassica vegetables, and the objective of this work was to gather crop tolerance data for Zeus on a wide variety of Brassica vegetables.

During 2019 we evaluated Zeus at 0.07, 0.094 and 0.14 lbs. ai/A applied 72 hours before seeding or transplanting and S-metolachlor (Dual Magnum) at 0.33, 0.5 and 0.65 lbs. ai/A PRE, and oxyfluorfen at 0.25 and 0.5 lbs. ai/A POST on direct seeded Bok choy, broccoli raab, collards, mizuna, mustard greens and radish, as well as transplanted Brussels sprouts and kale. The standard was Dacthal PRE at 7.5 lbs. ai/A. The trials were conducted at Salinas, CA during May to November 2019. The Bok choy and broccoli raab trial ran May 3 to June 24; the collard and mizuna trial ran May 3 to June 26, and the radish and mustard greens trial ran June 20 to August 2. The Brussels sprouts and kale study was transplanted June 20, and the kale was harvested August 20. Brussels sprouts will be harvested likely in November. Treatments were replicated 4 times and arranged in a randomized complete block design. Data collected was crop injury estimates, stand and yield as well as weed control. Data were subjected to analysis of variance and mean separation was performed using LSD's.

Results.

Seeded crops. Dacthal and Dual Magnum caused little or no visible injury to Bok choy, broccoli raab, collards, and mizuna, radish or mustard greens (Table 1). Collards, radish and mustard greens were tolerant to Zeus at 0.07 and 0.094 lbs. ai/A but not at 0.14 lbs. ai/A. Bok choy, broccoli raab, and mizuna were injured by Zeus at all rates. GoalTender at 0.25 and 0.5 lbs. ai/A caused moderate to severe injury to all seeded crops (Table 2). None of the herbicides reduced yield in Collards (Table 3). Compared to Dacthal, yields in Dual Magnum treatments were similar. GoalTender reduced yields in mizuna, radish and mustard greens. GoalTender caused marginal yield reductions in Bok choy and broccoli raab.

Transplanted crops. Brussels sprouts and kale were established as transplants. Dacthal, Zeus and Dual Magnum were safe on Brussels sprouts and kale (Table 4). GoalTender was mostly safe on Brussels sprouts. GoalTender caused severe injury in kale. None of the herbicide treatments reduced kale yield. Brussels sprouts was not yet harvested at the time of this report.

Literature Cited

Dacthal 2018. Dacthal Flowable Herbicide label. https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Dacthal_Flowable1_Label.pdf

Goaltender 2006. GoalTender Supplemental label (SLN CA-060023) for postemergence use in broccoli and cauliflower [https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Goaltender_\(Ca-060023_Postemergence_-_Broccoli_Cauliflower\)_Section_24C.pdf](https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Goaltender_(Ca-060023_Postemergence_-_Broccoli_Cauliflower)_Section_24C.pdf)

GoalTender 2018a. 24(c) GoalTender. Special Local Need Registration SLN CA-070006 For Application to Dry Bulb Onions at the First True Leaf Growth Stage. https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/GoalTender_Section_24c7h.pdf

GoalTender 2018b. GoalTender sample label. https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/GoalTender_Label1k.pdf

Table 1. Crop injury (0 =no injury, 10=dead) estimates in direct seeded crops

Treatment	Rate	Timing	Bok choi	Broccoli raab	Collards	Mizuna	Radish	Mustard greens
	Lbs ai/A		Crop injury (0-10)					
Nontreated	0	---	0.0 d	0.0 e	0.0 d	0.0 b	0.0 d	0.0 c
Dacthal	7.5	PRE	0.9 d	1.3 d	0.0 d	0.6 b	0.0 d	0.0 c
Zeus	0.07	PREPL	3.0 c	4.9 c	1.6 c	8.5 a	1.5 bc	0.3 c
Zeus	0.094	PREPL	4.5 b	6.9 b	2.3 b	9.3 a	2.0 ab	1.4 b
Zeus	0.14	PREPL	8.9 a	9.4 a	3.8 a	9.6 a	2.6 a	2.4 a
Dual Magnum	0.33	PRE	0.1 d	0.0 e	0.0 d	0.3 b	0.0 d	0.0 c
Dual Magnum	0.5	PRE	0.0 d	0.5 de	0.0 d	0.6 b	0.3 d	0.0 c
Dual Magnum	0.65	PRE	0.4 d	0.3 e	0.3 d	0.6 b	0.8 cd	0.3 c

Table 2. Initial crop injury (0 =no injury, 10=dead) estimates for POST applications on on direct seeded crops.

Treatment	Rate	Timing	Bok choi	Broccoli raab	Collards	Mizuna	Radish	Mustard greens
	Lbs ai/A		Crop injury (0-10)					
Nontreated	0	---	0.0 c	0.0 c	0.0 c	0.0 c	0.0 c	0.0 c
GoalTender	0.25	POST	3.5 b	5.6 b	2.4 b	5.8 b	5.3 a	7.8 b
GoalTender	0.5	POST	4.7 a	6.9 a	3.6 a	6.6 a	5.8 a	8.8 a

Table 3. Fresh weights in direct seeded crops

Treatment	Rate	Timing	Bok choi	Broccoli raab	Collards	Mizuna	Radish	Mustard greens
	Lbs ai/A		(tons/A)					
Nontreated	0	---	14.1 abc	0.95 a	7.3	4.6 ab	6.0 ab	7.90 a
Dacthal	7.5	PRE	15.0 a	0.73 bc	7.2	5.0 a	6.9 a	9.48 a
Zeus	0.07	PREPL	14.3 abc	0.52 cd	6.8	2.7 cd	5.9 ab	8.78 a
Zeus	0.094	PREPL	12.7 bcd	0.43 de	6.3	1.7 de	5.4 bc	8.83 a
Zeus	0.14	PREPL	11.1 d	0.30 e	6.3	0.7 e	4.3 c	8.88 a
GoalTender	0.25	POST	12.4 cd	0.66 bc	6.6	2.9 cd	2.3 d	3.91 b
GoalTender	0.5	POST	13.5 abc	0.52 cd	6.1	3.2 bcd	1.8 d	2.92 b
Dual Magnum	0.33	PRE	13.9 abc	0.82 ab	6.1	3.0 bcd	7.1 a	8.60 a
Dual Magnum	0.5	PRE	14.4 ab	0.78 ab	6.6	4.1 abc	7.1 a	8.93 a
Dual Magnum	0.65	PRE	14.8 a	0.68 bc	7.1	4.3 abc	7.1 a	9.50 a

Table 4. Injury estimates in transplanted Brussels sprouts and kale and fresh weights in kale. Brussels sprouts will be harvested November 2019.

Treatment	Rate	Timing	Brussels sprouts	Kale	Brussel sprouts	Kale	Kale
	Lbs ai/A		Crop injury (0-10)			Tons/A	
Nontreated	0	---	0.0 c	0.0 b	0.0 c	0.0 c	8.4
Dacthal	7.5	PRE	0.0 c	0.0 b			8.6
Zeus	0.07	PREPL	0.0 c	0.5 ab			8.0
Zeus	0.094	PREPL	0.0 c	0.1 b			8.3
Zeus	0.14	PREPL	1.0 a	1.0 a			8.6
GoalTender	0.25	POST	---	---	1.4 b	5.8 b	8.0
GoalTender	0.5	POST	---	---	2.5a	6.6 a	8.2
Dual Magnum	0.33	PRE	0.0 c	0.0 b			7.8
Dual Magnum	0.5	PRE	0.4 b	0.0 b			8.8
Dual Magnum	0.65	PRE	0.0 c	0.3 b			8.1