2008 Spinach Weed Control Trials

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Summary: These trials were conducted to evaluate herbicides for weed control in spinach. Kerb was tested in trial no. 1, but was found to be too injurious to spinach and was not included in further trials. The lowest rate of Dual Magnum, 0.3 pint/A, was included to tests its efficacy and safety; this was done because significant phytotoxicity of Dual Magnum has been observed at the 0.5 pint rate. Three rates of Lorox were tested. The rate that we feel has promise for spinach is the 0.4 lb/A rate; the 0.8 lb/A rate was included to see if there was a 2x safety factor. This set of trials underscored the need for careful evaluation of the soil type and associated rate of herbicide for spinach production. Table 1 summarizes the overall yields from five trials. Dual Magnum at 0.5 pint/A and Lorox at 0.4 lb/A on average only had 75 and 70% of the yield of the untreated, respectively. In contrast, RoNeet at 1.25 pints and Dual Magnum at 0.3 pint/A had 81 and 91% of the yield of the untreated, respectively. This data indicates that all of the herbicides have the potential to reduce the yield of spinach. Lorox is a new potential herbicide for use on spinach. At the 0.4 lb/A rate it was safe on the spinach at some sites with higher organic matter and more clay, but not safe on sandier, low organic matter sites. More research needs to be conducted with this material to better understand the limits of its utility for use on spinach.

Methods: ***Trial No 1:*** The trial was conducted in cooperation with Frank Heffren of Green Valley Farm Supply and Tony Alameda of Top Flavor Farms in San Juan Bautista. The trial was planted on April 11 with the variety Grinta. Treatments were applied on the same day and the field was sprinkler irrigated on April 12. The soil type was Sorrento silt loam. ***Trial No 2:*** The trial was established in cooperation with John Pattullo of Boutonnet Farms and Mark McLaughlin of Kleen Globe in Castroville. The trial was planted on June 12 with the variety Swan. Treatments were applied on the same day and the field was sprinkler irrigated on June 13. The soil type was Arnold Loamy Sandy at the top of the trial grading into Diablo Clay at the bottom. ***Trial No. 3:*** Established with Chris Drew of Sea Mist Farms and Luke Pawlak of Kleen Globe in Castroville. The field was seeded and sprayed on July 16 and was watered on July 17. The variety was Emu. The soil at the site was Cropley silty clay. ***Trial No. 4:*** Established with Pete Anecito of Fresh Farms in San Ardo. The soil at the site was Greenfield fine sandy loam. All materials were applied post plant preemergence on July 22 and was watered on July 23. ***Trial No. 5:*** The trial was conducted in cooperation with Metz Fresh in Chualar on a Chualar Loam Soil. The trial was planted and the sprayed on August 18 and first water was applied on August 19. ***Detail for all trials:*** Unless noted otherwise each plot was one 80-inch bed wide by 10 feet long and replicated 3 times in a randomized complete block design. Materials were applied with a CO_2 backpack sprayer using a one wand nozzle with an 8008E tip at 30 psi. Four passes with the wand applied the equivalent of 72 GPA of water.

Results: ***Trial No. 1:*** All materials except Kerb had acceptable phytotoxicity ratings on May 2 (Table 2). Kerb at all rates dramatically reduced spinach yield. Dual Magnum at 0.5 pint and Lorox at 0.2 and 0.4 lb/A gave the highest yield of the herbicide treatments. ***Trial No. 2:*** There was good weed pressure at this site. Lorox at 0.4 lb/A controlled 60% of the weeds and provided the best weed control of the herbicides used alone while the combination of Lorox at 0.4 lb/A + Dual Magnum at 0.5 pint/A controlled 76% of the weeds (Table 3). All treatments had acceptable phytotoxicity ratings on July 10. Lorox at 0.4 lbs and the combination of Lorox at 0.4 lb/A + Dual Magnum at 0.5 pint/A reduced weeding time the most. All treatments had

acceptable yields. ***Trial No. 3:*** There was moderate weed pressure at this site. Lorox at 0.8 lb/A and the combination treatments provided 100% weed control of all weeds (Table 4). Lorox at 0.8 lb/A and the combination of Lorox at 0.4 lb/A + Dual Magnum 0.5 pint/A both unacceptably high phytotoxicity ratings on both evaluation dates. These injurious treatments also had the lowest weeding times. Lorox at 0.4 lb/A also had low weeding time. The injurious treatments reducing the yield the most. Dual Magnum at 0.5 pint/A and Lorox at 0.4 lb/A significantly reduced the yield in comparison with the untreated control. ***Trial No. 4:*** There were not sufficient weeds at this site for rating. Lorox at 0.8 lb/A and the combination treatments were the most injurious to the spinach (Table 5). All materials reduced the yield of spinach, but Lorox at 0.8 lb/A and the combination treatments reduce yield the most. ***Trial No. 5:*** A trial was conducted at this site because of the sandy, gravelly soil type. We wanted to evaluate the safety of the herbicides on this "worst case" type of scenario. There was low weed pressure at this site and all materials controlled 100% of the weeds (Table No. 6). All materials reduced the yield of spinach, but Lorox at 0.4 and 0.8 and the combination treatments were particularly damaging (see photos below).

Untreated foreground
Lorox at 0.8 lb/A

Untreated foreground
Dual Magnum at 0.5 pt/A

Untreated foreground Lorox at 0.4 lb/A

Table 1. Yield summary of five trials

Treatment	lbs a.i./A	Material/A	Trial 1 T/A	Trial 2 T/A	Trial 3 T/A	Trial 4 T/A	Trial 5 T/A	Mean yield Tons/A	Percent yield of untreated
RoNeet 6E	0.93	1.25pints	4.28	8.83	12.34	8.33	6.01	7.96	81.6
Dual Magnum 7.63	0.29	0.30pints	----	----	12.07	8.80	5.78	8.88	91.0
Dual Magnum 7.63	0.48	0.50pints	4.47	9.09	11.90	7.87	3.56	7.38	75.6
Lorox 50	0.10	0.2 lbs	4.54	9.23	12.16	9.35	7.00	8.46	86.7
Lorox 50	0.20	0.4 lbs	4.57	8.50	10.11	8.89	2.20	6.85	70.2
Lorox 50	0.30	0.6lbs	3.67	----	----	----	----	3.67	37.6
Lorox 50	0.40	0.8 lbs	----	----	3.12	2.06	0.00	2.59	26.5
Lorox 50 + Dual Magnum 7.63	0.10 0.48	0.2 lbs 0.50pints	----	8.78	9.67	8.52	2.15	7.28	74.6
Lorox 50 + Dual Magnum 7.63	0.20 0.48	0.4 lbs 0.50pints	----	8.15	7.23	5.25	0.41	5.26	53.9
Untreated	----	----	4.79	8.77	13.95	11.52	7.58	9.76	100.0
Pr>F for yield	----	----	<0.0001	0.9795	<0.0001	0.0007	<0.0001	------	------
LSD for yield	----	----	1.1108	NS	2.2705	3.141	2.1488	-----	-----

Table 2. Trial No. 1: Phytotoxicity ratings on May 2 and yield evaluations on May 6.

Treatment	Lbs a.i./A	Material/A	Phyto[1]	Dry Wt. Lbs/A	Fresh Wt. Lbs/A
RoNeet 6E	0.93	1.25 pints	0.00	754.8	7,780.8
Dual Magnum 7.63	0.48	0.50 pint	0.33	998.2	8,112.1
Lorox 50	0.10	0.2 lbs	0.00	1,022.6	8,232.4
Lorox 50	0.20	0.4 lbs	0.00	858.0	8,296.1
Lorox 50	0.30	0.6 lbs	1.00	777.8	6,659.8
Kerb 3.3SC	0.50	1.2 pints	9.17	104.4	789.1
Kerb 3.3SC	1.0	2.4 pints	9.83	ND[2]	ND
Kerb 3.3SC	2.0	4.8 pints	10.00	ND	ND
Untreated	----	---	0.00	992.9	8,681.6
Pr>F			<0.0001	0.0001	<0.0001
LSD 0.05			0.6504	269.2	2015.7

1 – rating: 0= no crop damage to 10=crop dead; 2 – No yield.

Table 3. Trial No. 2: Weed counts (0.5 m^2) on July 1, phytotoxicity, time of weeding and yield evaluation on July 10. Upper number in each cell is weed counts and lower number is percent weed control

Treatment	Lbs a.i./A	Material/A	NLFG	Purslane	Night shade	Malva	Others[1]	Total	Phyto[2]	Weeding Time hrs/A	Yield Tons/A
RoNeet 6E	0.93	1.25 pints	26.0 36.7	3.0 50.5	2.7 43.8	0.0 100.0	1.7 22.2	33.3 41.3	0.0	141.2	8.83
Dual Magnum 7.63	0.48	0.5 pints	34.7 23.5	3.3 60.6	2.7 45.7	0.0 100.0	0.3 94.4	41.0 25.7	0.33	156.9	9.09
Lorox 50	0.1	0.2 lbs	43.7 48.3	5.3 38.9	7.3 14.3	0.3 66.7	3.0 0.0	59.7 24.2	0.0	216.4	9.23
Lorox 50	0.2	0.4 lbs	14.3 72.9	1.0 87.5	3.3 25.7	0.7 33.3	3.3 33.3	22.7 60.9	0.3	87.7	8.50
Lorox 50 + Dual Magnum 7.63	0.1 0.48	0.2 lbs 0.5 pints	21.3 40.6	4.0 26.4	1.7 48.6	0.3 66.7	0.3 66.7	27.7 43.6	0.0	109.3	8.78
Lorox 50 + Dual Magnum 7.63	0.2 0.48	0.4 lbs 0.5 pints	4.7 92.1	0.7 66.7	5.0 28.6	0.0 100.0	1.3 50.0	11.7 76.7	0.7	74.2	8.15
Untreated	----	----	48.7 0.0	6.3 0.0	4.7 0.0	0.3 0.0	2.0 0.0	62.0 0.0	0.0	374.7	8.77
Pr>F	----	----	0.3922	0.1374	0.3938	0.5323	0.4056	0.1696	0.3282	0.0003	0.9795
LSD 0.05	-----	----	NS	NS	NS	NS	NS	NS	NS	96.8	NS
Pr>F % control	----	----	0.0700	0.1152	0.1849	0.0609	0.0518	0.0220	----	----	----
LSD 0.05 % control	----	----	NS	NS	NS	NS	NS	39.6480	----	----	----

1 - includes shepherd's purse, nettle and chickweed; 2 – rating: 0= no crop damage to 10=crop dead.

Table 4. Trial No. 3: Weed counts (10 ft^2) on July 29, phytotoxicity (two dates) and time of weeding on August 7 and yield evaluation on August 14. Upper number in each cell is weed counts and lower number is percent weed control.

Treatment	Lbs a.i./A	Material/A	Sow Thistle	Shepherd's Purse	Others[2]	Total Weeds	Phyto[1] July 29	Phyto[1] Aug. 7	Weeding Time hrs/A	Yield Tons/A
RoNeet 6E	0.93	1.25 pints	2.3 37.6	0.0 66.7	0.0 66.7	4.7 38.3	0.0	0.0	58.4	12.34
Dual Magnum 7.63	0.29	0.30 pint	2.0 61.8	0.7 85.2	0.3 66.7	3.7 67.1	0.0	0.0	58.0	12.07
Dual Magnum 7.63	0.48	0.50 pint	0.7 88.0	0.0 100.0	0.0 100.0	1.0 91.1	1.3	0.7	52.6	11.90
Lorox 50	0.1	0.2 lbs	2.7 58.3	0.0 100.0	0.3 66.7	4.0 68.3	0.0	0.0	64.1	12.16
Lorox 50	0.2	0.4 lbs	0.0 100.0	0.0 100.0	0.0 100.0	0.7 95.2	1.0	1.3	35.6	10.11
Lorox 50	0.4	0.8 lbs	0.0 100.0	0.0 100.0	0.0 100.0	0.0 100.0	4.0	5.0	22.6	3.12
Lorox 50 Dual Magnum 7.63	0.1 0.48	0.2 lbs 0.50 pint	0.0 100.0	0.0 100.0	0.0 100.0	0.0 100.0	1.0	1.0	40.3	9.67
Lorox 50 Dual Magnum 7.63	0.2 0.48	0.4 lbs 0.50 pint	0.0 100.0	0.0 100.0	0.0 100.0	0.0 100.0	2.0	3.0	26.4	7.23
Untreated	----	----	6.7 0.0	4.0 0.0	0.7 0.0	13.3 0.0	0.0	0.0	122.5	13.95
Pr>F weed count	----	----	0.0033	0.0773	0.2462	0.0021	<0.0001	<0.0001	0.0003	<0.0001
LSD 0.05 weed count	----	----	3.0	NS	NS	5.5	0.7812	0.9	32.5	2.27
Pr>F % control			0.0005	0.0003	0.0452	<0.0001	----	----	----	----
LSD 0.05 % control			40.1	35.6	61.1	32.2	----	----	----	----

1 – rating: 0= no crop damage to 10=crop dead; 2 – includes mustard and chickweed

Table 5. Trial No. 4: Phytotoxicity rating on August 8 and yield August 13

Treatment	Lbs a.i./A	Material/A	Phyto[1]	Yield Tons/A
RoNeet 6E	0.93	1.25 pints	0.3	8.33
Dual Magnum 7.63	0.29	0.30 pints	0.0	8.80
Dual Magnum 7.63	0.48	0.50 pints	1.3	7.87
Lorox 50	0.1	0.20 lbs	0.0	9.35
Lorox 50	0.2	0.40 lbs	1.3	8.89
Lorox 50	0.4	0.80 lbs	5.7	2.06
Lorox 50 + Dual Magnum 7.63	0.1 0.48	0.20 lbs 0.50 pints	2.0	8.52
Lorox 50 + Dual Magnum 7.63	0.2 0.48	0.40 lbs 0.50 pints	3.3	5.25
Untreated	----	----	0.0	11.52
Pr>F	----	----	<0.0001	0.0007
LSD 0.05	----	----	0.7	3.14

1 – rating: 0= no crop damage to 10=crop dead.

Table 6. Trial No. 5: Weed counts (6 ft^2) ratings and phytotoxicity on September 3 and yield evaluation on September 18. Upper number in each cell is weed counts and lower number is percent weed control.

Treatment	Lbs a.i./A	Material/A	Purslane	Shepherd's Purse	Total Weeds	Phyto[1]	Yield Tons/A
RoNeet 6E	0.93	1.25 pints	0.0 100.0	0.0 100.0	0.0 100.0	0.7	6.01
Dual Magnum 7.63	0.29	0.30 pints	0.0 100.0	0.0 100.0	0.0 100.0	0.3	5.78
Dual Magnum 7.63	0.48	0.50 pints	0.0 100.0	0.0 100.0	0.0 100.0	1.7	3.56
Lorox 50	0.1	0.20 lbs	0.0 100.0	0.0 100.0	0.0 100.0	0.0	7.00
Lorox 50	0.2	0.40lbs	0.0 100.0	0.0 100.0	0.0 100.0	5.0	2.20
Lorox 50	0.4	0.80 lbs	0.0 100.0	0.0 100.0	0.0 100.0	9.5	0.0
Lorox 50 + Dual Magnum 7.63	0.1 0.48	0.20 lbs 0.50 pints	0.0 100.0	0.0 100.0	0.0 100.0	4.3	2.15
Lorox 50 + Dual Magnum 7.63	0.2 0.48	0.40 lbs 0.50 pints	0.0 100.0	0.0 100.0	0.0 100.0	8.7	0.41
Untreated	----	---	1.0 0.0	4.7 0.0	5.7 0.0	0.0	7.58
Pr>F weed count			0.4726	<0.0001	<0.0001	<0.0001	<0.0001
LSD 0.05 weed count			0.9	0.9	1.4	1.9	2.1488
Pr>F % control			<0.0001	<0.0001	<0.0001	----	----
LSD 0.05 % control			0.1	0.1	0.1	----	----

1 – rating: 0= no crop damage to 10=crop dead.