

Herbicide Evaluation in Basil: Collecting Data to Support Registration of Sulfentrazone on Basil

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Background

Commercial basil is usually grown without the application of herbicide after plant emergence. Therefore, a pre-emergent spray plays an important role in weed control. In California, basil growers are affected by a limited number of pre-emergent herbicides, resulting in tremendous cost for cultivation and hand removal. In this situation, screening existing pre-emergent herbicides and collecting their performances on weed suppression will help support registration, thereby offering basil and other herb growers more choices for chemical weed control and reducing labor cost.

In 2019, two separate field trials were conducted on commercial fields of Ratto Bros Inc. at Modesto, California to compare the performance of Zeus XC (39.6% Sulfentrazone) with the grower's standard herbicide, Devrinol 50-DF (50% Napropamide), on basil weed control and productivity. In 2020, a third field trial was implemented with a modified testing protocol to collect more efficacy data. The study was financially supported by the Western Region IR-4. In this poster, only the results from 2019 trials were included. Results from the 2020 trial will be reported as they become available.

Trial Setup

- In 2019, four basil varieties 'Passion', 'Obsession', 'Devotion', and 'Helena' were double-line seeded on a 1-m wide bed on April 12 (Trial 1) and May 7 (Trial 2), respectively.
- For each basil variety, the study was a randomized complete block design with four application rates and one herbicide-free, hand-weeding control plot. Each treatment was replicated four times.
- The Zeus XC and Devrinol 50-DF were soil sprayed a day after seeding at the rates indicated in Table 1.

Table 1. Treatments of the Sulfentrazone evaluation trial in basil fields in Modesto, California.

Herbicide trade name	Active ingredient	Rate of products	Rate of active ingredient	Application timing
Untreated-hand weeding	Plots were hand weeded at five weeks after seeding.			
Zeus XC	Sulfentrazone	0.29 L/ha	0.14 kg/ha	Broadcast to soil right after seeding
Zeus XC	Sulfentrazone	0.44 L/ha	0.21 kg/ha	
Zeus XC	Sulfentrazone	0.58 L/ha	0.28 kg/ha	
Devrinol 50-DF*	Napropamide	2.8 kg/ha	1.4 kg/ha	

*Devrinol 50-DF is the grower's standard herbicide. Actual trade name may be different from the table.

Data Collection

- Weed control and leaf injury:** Starting at day 7 after seeding, a total area of 0.74 m² was framed and pictured from each treatment at a weekly basis until day 70 and 63 for Trials 1 and 2. Leaf injury was monitored on each weekly picture day. Weeds were rated by scales 0-5 (Figure 1).
- Harvest and leaf fresh biomass:** Both trials were hand harvested on June 28 and July 12, 2019. For each treatment, plants were harvested in the area showed in Figure 2 by cutting the stem at 7.5 to 10 cm above soil. Leaf biomass was weighed in the lab and reported here in a unit of kg/100 m².

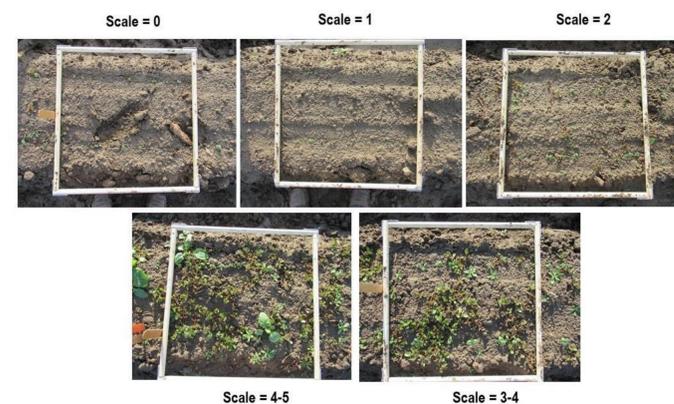


Figure 1. Pictorial examples of weed ratings. 0 = no visible weeds in the frame area, 1 = visible weeds ≤ 10% of the frame area, 2 = visible weeds between 10% and 25%, 3 = visible weeds between 25% and 50%, 4 = visible weeds between 50% and 75%, and 5 = visible weeds ≥ 75%.



Figure 2. The dimension of each harvested treatment (1.22 m × 0.61m).

Result-Daily air temperature and growth inhibition

- Daily high and low air temperature during Trial 2 (28.8 °C and 11.8 °C) was 1.5 and 1.2 degrees Celsius higher than the temperatures during Trial 1 (27.3 °C and 10.6 °C) (Figure 3).
- Leaf injury and growth inhibition due to different application rates of Zeus XC was varied between trials.
- Leaf stunting and germination inhibition were observed for plots sprayed with Zeus XC at each rate in Trial 2, while no injury or germination inhibition was observed in Trial 1 (See the example in Figure 4).

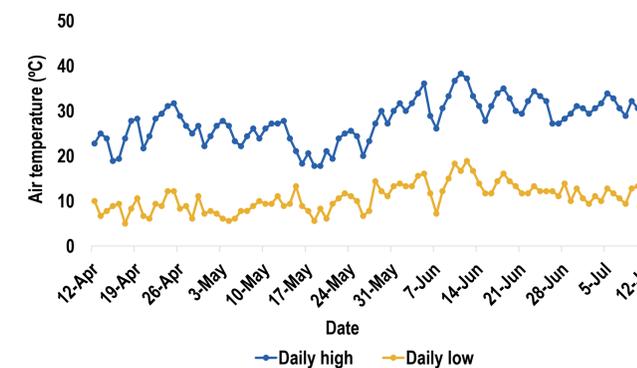


Figure 3. Daily high and low air temperature during both trials (April 12 – June 28; May 7 – July 12) in Modesto, California.

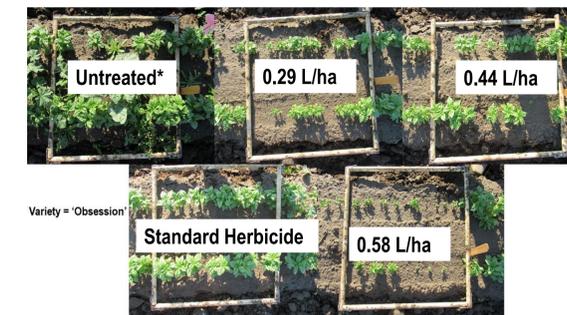


Figure 4. Pictorial comparisons of herbicide injury and growth inhibition for basil variety 'Obsession' in Trial 2 at 35 days after seeding (*Weeds were hand removed after the picture was taken).

Result-Weed control and leaf biomass

- Both herbicides showed their efficacy on controlling weeds for the first month after seeding in both runs for each variety.
- Primary weed species in both fields were common purslane (*Portulaca oleracea*) and mallows (*Malva parviflora*).
- Application of Zeus XC at higher rates significantly reduced leaf biomass in Trial 2 compared to non- and standard herbicide treatments. Whereas, plots in Trial 1 applied with Zeus XC produced comparable plant biomass for each variety with very few exemptions (Table 2).

Table 2. Average leaf biomass (kg/100 m²) of each basil variety for Trials 1 and 2 in Modesto, California.

Treatment/Variety (Trial 1)	Passion	Obsession	Devotion	Helena
Non-herbicide	176.1 A	182.5 AB	179.5 B	185.4 B
0.29 L/ha	178.1 A	182.0 AB	194.2 AB	219.1 AB
0.44 L/ha	198.6 A	177.1 AB	206.4 A	219.1 AB
0.58 L/ha	177.1 A	160.5 B	186.9 AB	221.5 A
Standard herbicide	191.2 A	192.2 A	195.1 AB	227.3 A
LSD _{0.05}	32.2	27.8	26.3	36.1
Treatment/Variety (Trial 2)	Passion	Obsession	Devotion	Helena
Non-herbicide	350.8 A	350.9 A	379.7 A	291.8 A
0.29 L/ha	356.2 A	302.1 A	307.0 B	281.1 A
0.44 L/ha	236.2 B	232.8 B	287.4 BC	316.7 A
0.58 L/ha	81.5 C	167.9 C	231.3 C	232.8 A
Standard herbicide	368.4 A	350.4 A	335.7 AB	256.2 A
LSD _{0.05}	70.3	61.5	63.0	88.8

Summary

More solid data showing promising performances on weed control while not compromising basil growth are needed before moving forward.