P13120.21-CAP11
Glufosinate / safflower, UC Davis
Seth Watkins, Guy Kyser, Brad Hanson

In this trial we evaluated safety of applications of glufosinate (Rely 280® herbicide, Bayer Crop Science) applied preplant or postplant/preemergence in safflower var "CW99" at UC Davis during 2021.

The study site is on Yolo Silt Loam soil (sand : silt : clay in the top 30 cm = 7:67:26; organic matter 2.05%; pH 7.1; CEC 18.9 meq). The site was disked and rough prepped in fall 2020. Beds were shaped 3/23/21, incorporating an application of trifluralin (Treflan HFP®, 1 pt product/acre) and a starter fertilizer (NuCrop 8-24-6®, 25 lb N/acre).

The trial was established in March to April 2021. Plots were 5 ft wide (one bed) by 20 ft long. Five treatments (untreated, three timings of glufosinate, and one timing of glyphosate) were arranged in randomized complete blocks in four replications, for a total of 20 plots. All plots were maintained weed-free for the duration of the trial.

On 4/2/21, plots were seeded at 20 lb/acre to a depth of 2". The trial was designed to include application times 7 days before seeding, 3 days before seeding, and immediately after seeding. All treatments were applied broadcast to bare soil using a CO_2 backpack sprayer and a 5-ft boom with three TeeJet 11003AIXR nozzles. The spray volume was 30 GPA. Glufosinate (1.57 lb ai/acre, 86 oz/acre Rely 280®) was applied 3/25/21, 3/29/21, and 4/2/21 (after seeding). As a comparison, glyphosate (2.25 lb ae/acre, 64 oz/acre Roundup Weathermax®) was applied 4/2/21 after seeding. All herbicide treatments included ammonium sulfate (Bronc Max®, 1% v/v). Weather conditions for the three treatment times are shown in Table 1.

We made visual evaluations for crop injury four times and assessed percent flowering two times late in the season (Table 2). Plants were evaluated for injury such as cupping, twisting, stunting, or chlorosis. Percent flowering was assessed as the amount of flower cover over the whole plot, compared to the expected amount of cover at full flower.

We found no injury in glufosinate-treated plots, for any time of application at any evaluation. However, there was unexpected injury in plots treated with glyphosate preemergence, as observed 5/7/21 and 6/8/21. Injury consisted of approximately 1/3 reduction in size of plants, without any obvious twisting or necrosis. Previously we haven't seen this kind of response to preemergence applications of glyphosate, so we posit that this injury may have been due to a contaminant in the glyphosate, which is kept in a maintenance container shared among several researchers and students. We compared flowering values using ANOVA in JMP 16. Percent flowering was not different among treatments, including the glyphosate treatment.

Weather (high and low temperatures), precipitation, and irrigation amounts from bed prep to the final evaluation are attached below.

Table 1. Weather conditions at the time of three applications.

Date	Time finished	Air temp (ºF)	% RH	Wind mph, dir	Cloud cover (%)	Soil temp at 3" (ºF)	Soil surface moisture
3/25/21	0830	47	55	3 N	0	53	dry
3/29/21	0630	44	78	2 N	0	58	dry
4/2/21	1430	87	17	5 S	40	76	moist

Table 2. Injury ratings and percent flowering at several evaluation times.

Treatment[1]		When applied	Rate (product oz/acre)	Injury % (0 = no injury, 100 = dead); flowering %					
				4/16	*4/23*	*5/7*	*6/8*		*6/15*
				injury	injury	injury	injury	flower	flower
01	untrtd	- - -	- - -	0	0	0	0	18	100
02	Rely 280®	7 DBS	86	0	0	0	0	15	100
03	Rely 280®	3 DBS	86	0	0	0	0	23	100
04	Rely 280®	PPPE	86	0	0	0	0	20	100
05	Roundup Weathermax®	PPPE	64	0	0	38	30	15	100

[1]All treatments include AMS (Bronc Max®,1% v/v).

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TEMPERATURE, PRECIPITATION AND IRRIGATION DATA
Temperature and precipitation data from DAVIS.A, CIMIS #6 (38° 32' N, 121° 47' W, 60 ft elev)
Accessed 8/19/21
Irrigation data from site records

	Temp (F)		Water (inches)	
Date	Max	Min	Rain	Irrig
3/23/21	67	47	0	
3/24/21	70	47	0	
3/25/21	67	42	0	
3/26/21	73	48	0	
3/27/21	75	41	0	
3/28/21	80	43	0	
3/29/21	72	43	0	
3/30/21	76	53	0	
3/31/21	81	52	0	
4/1/21	83	45	0	1.0
4/2/21	81	43	0.02	
4/3/21	72	43	0	
4/4/21	68	41	0	
4/5/21	70	46	0	
4/6/21	75	42	0	
4/7/21	74	45	0	
4/8/21	77	39	0	0.5
4/9/21	75	44	0	
4/10/21	78	41	0	
4/11/21	82	45	0	
4/12/21	83	46	0	
4/13/21	74	49	0	
4/14/21	72	43	0	
4/15/21	74	45	0	
4/16/21	83	43	0	
4/17/21	85	46	0	
4/18/21	89	52	0	
4/19/21	84	45	0	
4/20/21	75	45	0.01	
4/21/21	78	47	0	0.5
4/22/21	73	45	0	
4/23/21	73	46	0	
4/24/21	69	48	0	
4/25/21	61	46	0.02	
4/26/21	66	41	0	
4/27/21	78	44	0	
4/28/21	86	45	0	0.5

	Temp (F)		Water (inches)	
Date	Max	Min	Rain	Irrig
4/29/21	88	48	0	
4/30/21	84	49	0	
5/1/21	82	48	0	
5/2/21	83	48	0	
5/3/21	88	64	0	
5/4/21	88	63	0	
5/5/21	91	56	0	
5/6/21	84	49	0	
5/7/21	81	48	0	
5/8/21	86	61	0	
5/9/21	86	66	0	
5/10/21	89	63	0	
5/11/21	92	50	0	
5/12/21	92	52	0	
5/13/21	86	49	0.01	
5/14/21	80	49	0.08	
5/15/21	73	50	0	
5/16/21	78	52	0	
5/17/21	76	50	0	
5/18/21	85	48	0.09	
5/19/21	77	49	0	
5/20/21	71	43	0.02	
5/21/21	73	53	0	
5/22/21	76	44	0.18	
5/23/21	79	52	0	
5/24/21	87	50	0.1	
5/25/21	82	59	0	
5/26/21	86	51	0	
5/27/21	86	49	0	
5/28/21	86	55	0	
5/29/21	85	52	0	
5/30/21	96	52	0	
5/31/21	102	56	0	
6/1/21	96	57	0	
6/2/21	93	54	0	
6/3/21	94	53	0	
6/4/21	91	57	0	

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Irrigation data from site records

	Temp (F)		Water (inches)			Temp (F)		Water (inches)	
Date	Max	Min	Rain	Irrig	Date	Max	Min	Rain	Irrig
6/5/21	89	52	0						
6/6/21	91	55	0						
6/7/21	82	53	0						
6/8/21	75	50	0						
6/9/21	75	46	0						
6/10/21	75	46	0						
6/11/21	81	48	0						
6/12/21	89	57	0						
6/13/21	89	59	0						
6/14/21	84	60	0						
6/15/21	88	50	0						