

# SAFETY AND EFFICACY OF HERBICIDES IN BEARING AVOCADO GROVES IN SOUTHERN CALIFORNIA



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## INTRODUCTION:

Currently there are 10 herbicide active ingredient groups registered for use on bearing avocado (*Persea americana* Mill.) in California. Of these, paraquat is a restricted use herbicide and glyphosate is under increasing political scrutiny. To provide more options for avocado producers, we conducted a study to evaluate the phytotoxicity and efficacy of several herbicides, currently registered in citrus, for use on bearing avocado.

## OBJECTIVE:

- To determine safety and efficacy of herbicides in bearing avocado as alternatives to glyphosate.

## METHODOLOGY:

- Treatments applied on 14 February 2020 at Hansen Research and Extension Center (HAREC) in Santa Paula, CA and 13 February 2020 at University of California-Riverside (UCR) in a randomized complete block design using 4 replicates.
- Plot sizes were 4 ft X 10 ft
- Total of 14 treatments were applied at each site (treatments and rates are in Table 1.).
- A 1% v/v methylated seed oil and crop oil concentrate was added to the saflufenacil.
- Ammonium sulfate was added at 2% w/v for saflufenacil and glyphosate treatments and 1% w/v for glufosinate treatments.
- Herbicide applications were made using calibrated CO<sub>2</sub> backpack sprayers using the rates and carrier volumes listed on labels for citrus.
- To determine plant safety, herbicides were applied directly to a selected branch.
- Following treatment applications, herbicides were incorporated using temporary sprinkler system to apply 0.5 inch of water.
- Weeds were to 2-4 inches tall when herbicides treatments were applied.
- Second application on 3 May 2020 at HAREC and on 4 May 2020 at UCR, plants were monitored for phytotoxicity at 1, 2, 4 and 8 weeks after treatment (WAT).
- During both treatments at both sites, a photolog had been maintained to show the progression of damage.
- Data were analyzed using ANOVA at a significance level of 0.05.



Table 1. Herbicides used during the experiment .

Treatment	Rate per acre	Treatment	Rate per acre
S-metolachlor	2 pt	Isoxaben	1.33 lb
Flumioxazin	12 oz	Saflufenacil	1 oz
Simazine	4.4 lb	Clethodim	16 oz
Rimsulfuron	4.0 oz	Caprylic Acid	9%
Oxyfluorfen	3.0 pt	Glufosinate	56 oz
Indaziflam	6.5 oz	Glyphosate	3.8 lb
Pendimethalin	6.3 qt	Untreated	

Research supported by:



Figure 5 (Right). Weed control at 8 WAT with (a) glufosinate, (b) glyphosate, (c) indaziflam, (d) rimsulfuron.

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Figure 1. Percent weed control at 1, 2, 4, and 8 weeks after treatment – Spring 2020

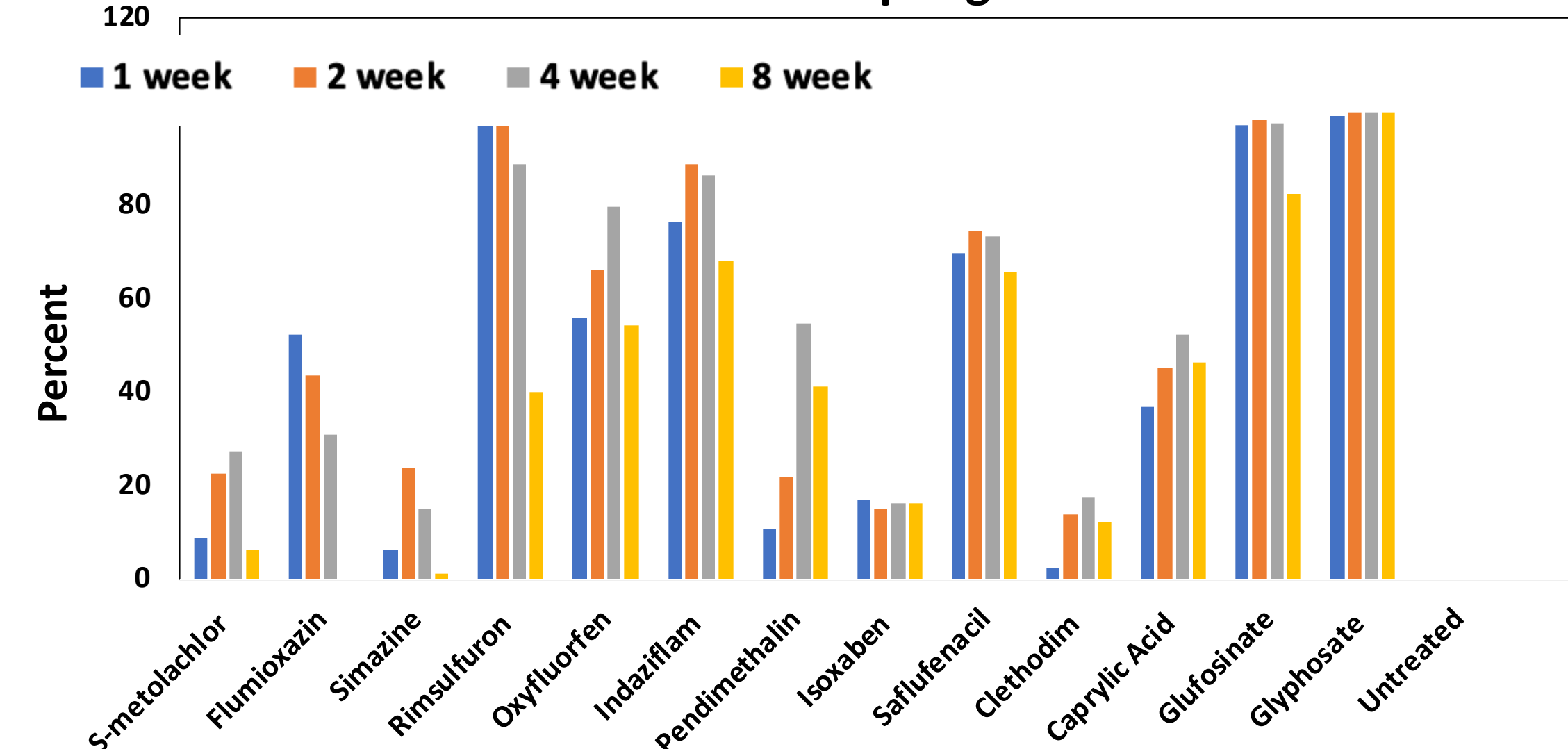


Figure 3. Percent weed control at 1, 2, 4, and 8 weeks after treatment – Fall 2020

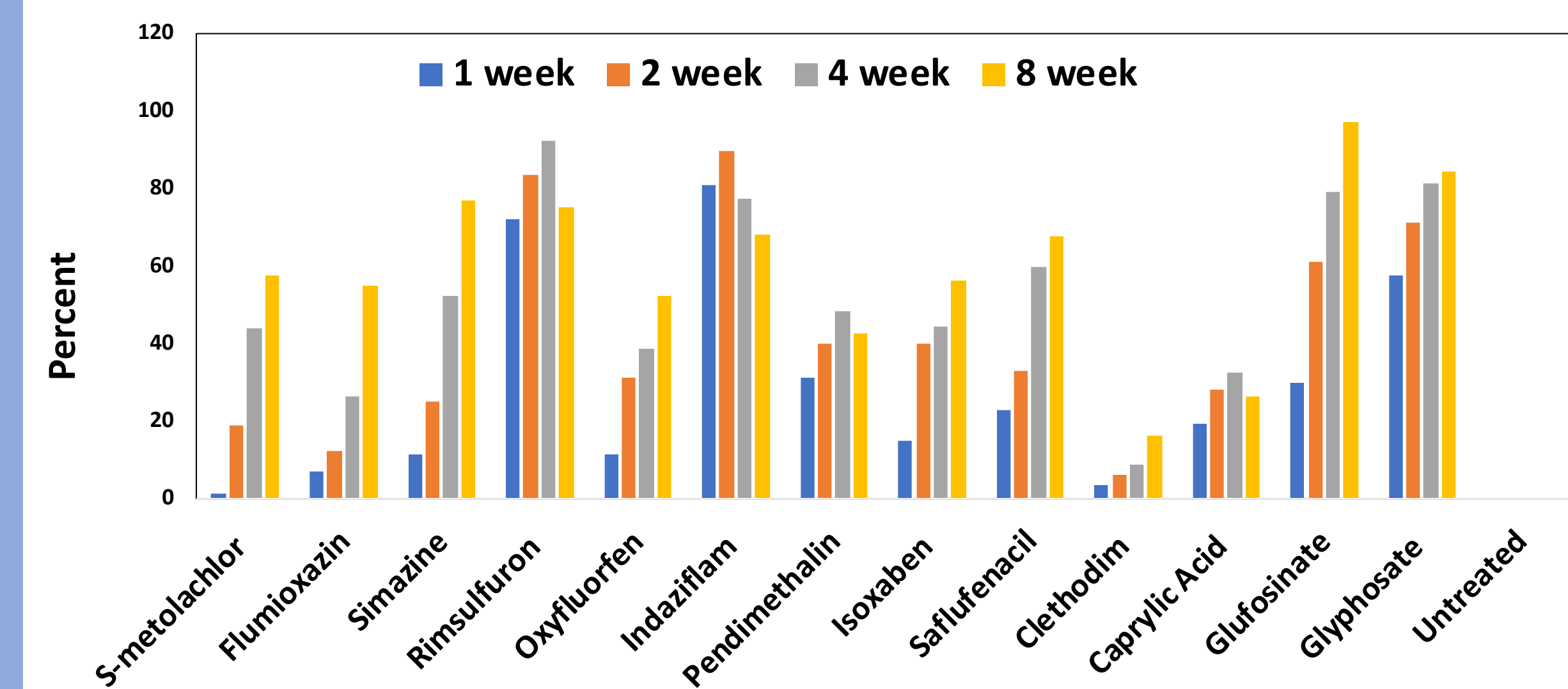


Figure 2. Phytotoxicity of the herbicide treatments on the avocado trees expressed as percent – Spring 2020

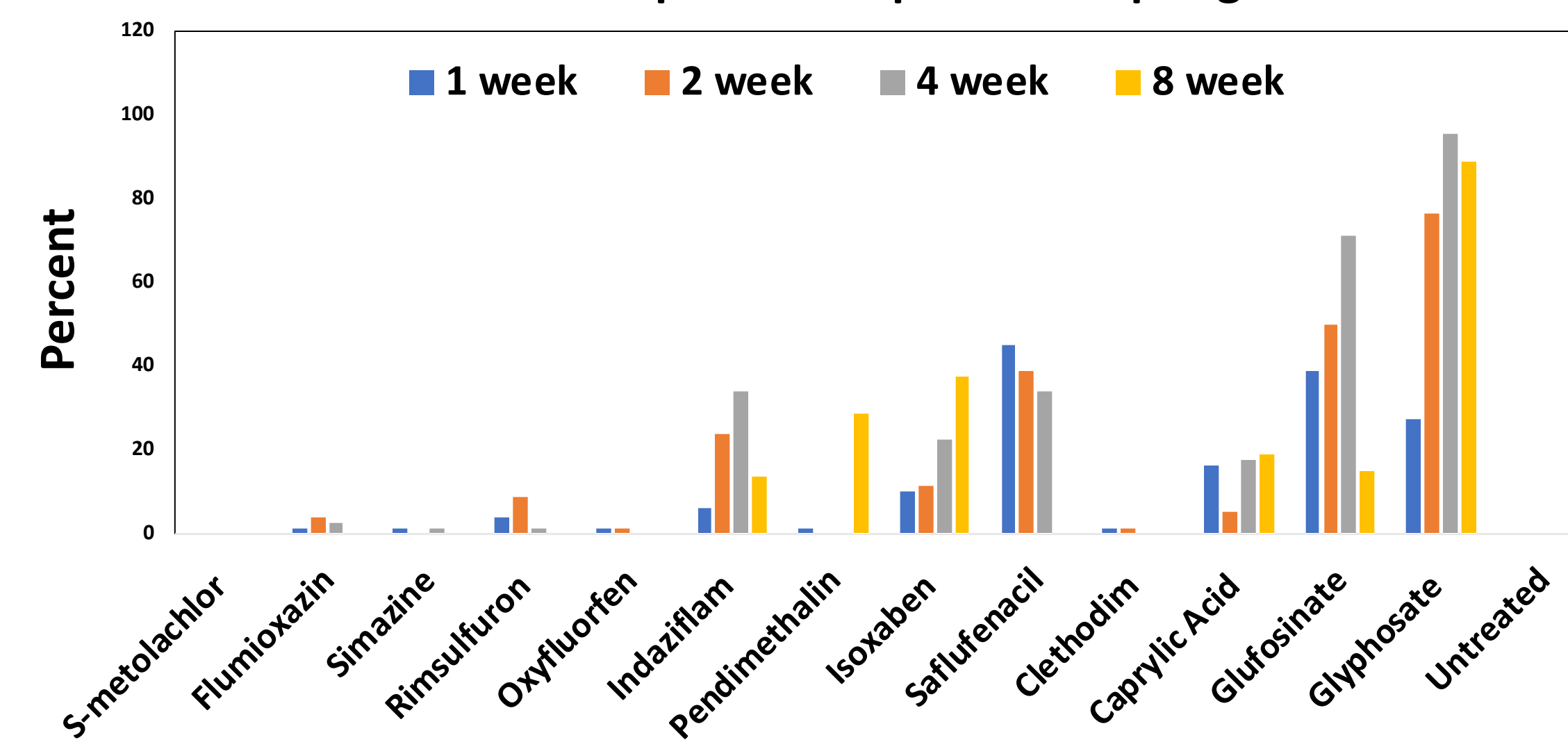
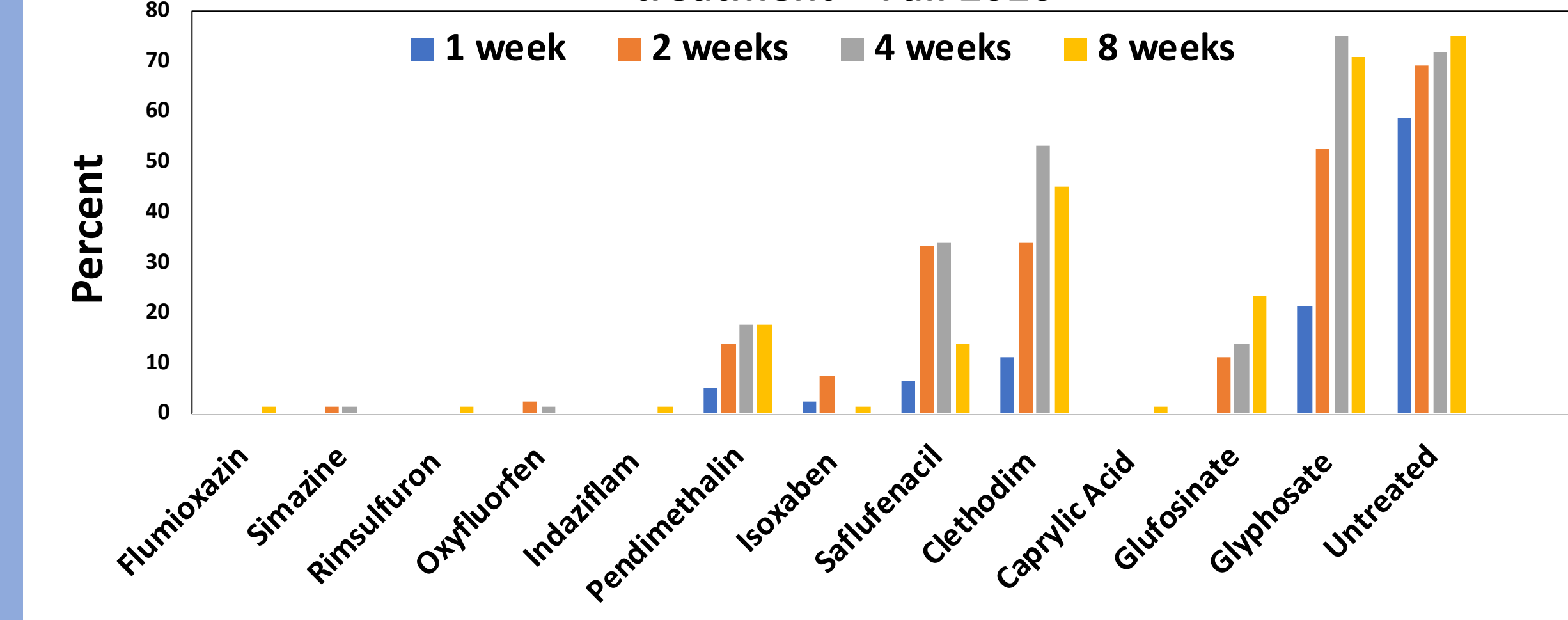


Figure 4. Phytotoxicity of the herbicide treatments on the avocado trees expressed in percent at 1, 2, 4, and 8 weeks after treatment – Fall 2020



## RESULTS and DISCUSSION:

Major weeds species were tumble pigweed (*Amaranthus albus*), common purslane (*Portulaca oleracea*), annual sowthistle (*Sonchus oleraceus*), *Malva parviflora*, *Urtica urens* and Hairy fleabane (*Erigeron bonariensis*) was also found sporadically throughout the orchard at UCR and were approximately 2-4 inches in height and diameter at the time of application..

Data were not normally distributed thus data were transformed using arcsine square root prior to analysis. The ANOVA and mean separation (LSD test) letters are based on transformed data but the actual mean and standard errors are shown in the tables.

### SPRING

- Glufosinate provided excellent weed control (Figure 1) through 8 WAT, however, it caused some injury at the beginning of the trial.
- At 8 WAT, the Glufosinate injury level was less significantly less visible (Figure 2). This may have been due to the young the new flush pushing out the injury seen on the leaves in the glufosinate plots.
- At 8 WAT, glyphosate had superior weed control followed by glufosinate. However, the glyphosate treatment also had the highest percentage of injury, follow by pendimethalin, isoxaben and saflufenacil.

### FALL

- Glufosinate and glyphosate provided consistent weed control for up to 8 WAT (Figure 3). Fall application was associated with an increase in phytotoxicity to the foliage (Figure 4) which was not seen in the spring glufosinate application.
- Overall, by 8 WAT, the glufosinate and indaziflam provided excellent weed control in the fall and spring with some minor damage in its first weeks after application, however, by 8 WAT, there was minimal leaf damage that could be seen in the indaziflam.
- Rimsulfuron also provided similar results and had exceptional weed control in the both spring and fall throughout the 8 weeks and resulted in no injury to the tree.

## CONCLUSION:

Preliminary results indicate that indaziflam and rimsulfuron have good potential for weed control in bearing avocado. Similarly, glyphosate and glufosinate also provided excellent control but can cause phytotoxicity in bearing avocados (Figure 5.). Data from year 2 is currently being analyzed.