

Palo Verde Valley Update

August 2022

The summer of 2022 has had its share of moisture, hot and some below average temperature days, clouds, and wind. The moisture, while not necessarily welcomed by those producing hay crops when hay is curing, has been beneficial in increasing the amount of water in Lake Mead.

The rain and accompanying wet field conditions have also slowed harvest schedules and have allowed weeds to go to seed with the extra time allowing additional seed to mature. This is not a good thing, especially when we see fields full of pigweeds/Palmer Amaranth (Fig. 1).



Fig. 1. Alfalfa field with weed pressure. This alfalfa field was removed from production, in part due to the intense weed pressure.

This Palo Verde Valley Update issue focuses on pigweeds and close relatives, and shares some research results from local experiments conducted over the past 12 months.

PIGWEEED SPECIES IDENTIFICATION

While there are several species of pigweeds in the low desert, Palmer amaranth is the one of most concern. This species has been documented to produce very high numbers of seeds per female plant, has developed resistance to glyphosate and other herbicides in multiple states, and is now found in alfalfa fields in the Palo Verde Valley.



Fig. 2. Palmer amaranth in the Palo Verde Valley. Leaves have long petioles, prominent veins from the mid-rib, and often have a whitish chevron shaped area on the diamond shaped leaves. Some people have commented that the leaf arrangement reminds them of poinsettia.

Palmer amaranth is an annual plant native to the arid southwestern United States and northwestern Mexico. It is a traditional food of several indigenous peoples. Its life-cycle is adapted to desert conditions; it will germinate and grow quickly. Some states currently have regulations against bringing Palmer amaranth seed or plant parts into their state.

Palmer amaranth looks a bit different than other pigweeds, with a key characteristic being that the leaf petiole is longer than the leaf. This is noted in the following pigweed identification table that was created by Dr. Lynn Sosnoskie, a former UCCE agronomy and weed science advisor in Madera and Merced Counties

Some characteristics for distinguishing among some commonly occurring pigweed species

Species	Leaf blades	Petiole length	Stem	Reproduction	Sharp bracts with flowers	Primary location of flowers
Redroot pigweed	hairy with prominent veins	shorter than leaf blade	hairy	male and female flowers on <u>same</u> plant	no	terminal spike
Prostrate pigweed	spoon-shaped, dark green	shorter than leaf blade	smooth succulent red	male and female flowers on <u>same</u> plant	no	leaf axils
Tumble pigweed	Light green, oval, wavy edges	shorter than leaf blade	smooth	male and female flowers on <u>same</u> plant	yes	leaf axils
Waterhemp	long, narrow, oval, dark green	shorter than leaf blade	smooth green or red	male and female flowers on <u>different</u> plants	no	terminal spike
Palmer amaranth	diamond-shaped, may have a chevron	longer than leaf blade	smooth green or red	male and female flowers on <u>different</u> plants	yes (females)	terminal spike

Palmer Amaranth is of concern to Palo Verde Valley alfalfa growers for multiple reasons:

- 1) Pigweed stems, being much thicker than alfalfa stems, slows down hay curing and increases chances of stack fires if not cured properly. The increase in curing time can also result in fewer harvests over an extended period as the cutting/harvesting cycles are lengthened.
- 2) Weedy alfalfa is not as desired by buyers compared to pure alfalfa
- 3) Palmer amaranth competes aggressively with crops. It has a fast growth rate of 2- 3 inches per day and commonly reaches heights of 6- 8 feet, greatly inhibiting crop growth.
- 4) Pigweeds utilize water for their growth.
- 5) Cutting the plants when harvesting alfalfa is not a highly effective control measure, as Palmer amaranth plants are usually not killed by mowing. They can regrow from cut stalks and set seed close to the ground.
- 5) High levels/prolific seed production. In Iowa, a single waterhemp plant was documented to produce over 2 million seeds. Researchers in Missouri reported no difference in number of seeds produced by individual waterhemp and Palmer amaranth plants. Reported average seed production per female Palmer amaranth plant is 400,000-1,000,000 seeds.

Palmer amaranth seeds can remain viable for several years. Those closest to the surface declined in viability faster than those deeper in the soil in a Georgia study. Low desert summer soil temperatures will be higher than those of Georgia however, and results may differ.

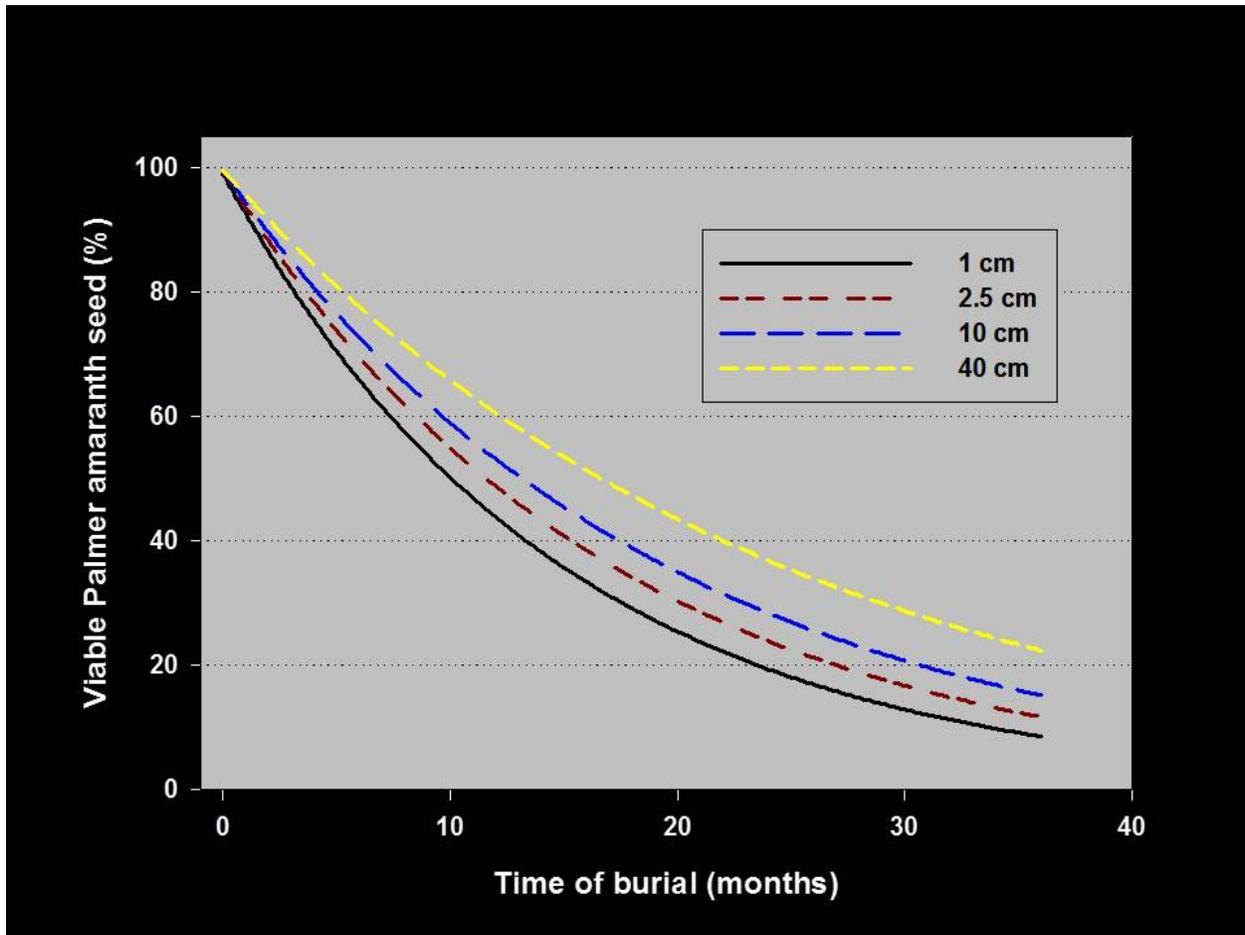


Fig. 3. Effects of seed burial depth and length of burial on Palmer amaranth seed viability. Sosnoskie, L.M., T.M. Webster and A.S. Culpepper. 2013. Glyphosate resistance does not affect Palmer amaranth (*Amaranthus palmeri*) seedbank longevity. *Weed Science*. 61:283-288

While swathing an alfalfa field generally does not kill Palmer amaranth plants, it can reduce subsequent seed production. A study of cutting heights (ground level, 1 inch, 6 inches and not cut at all) was conducted in the San Joachin Valley in cotton for the effects on seed production. Seed production per female plant in alfalfa in the low desert will probably be greater due to less competitive shading in comparison with cotton.

Cutting Height	Mean number of seeds produced per female plant
Ground level (0 inches)	700
1 inch above soil line	35,000
6 inches above soil line	100,000
Un-cut Palmer Amaranth plants	400,000

Local Research on Alfalfa and Pigweeds

During the past year, two field studies were initiated in the Palo Verde Valley to evaluate herbicide efficacy in alfalfa. The spring 2022 trial evaluated multiple pre-emergent herbicides. Multiple applications of a pre-emergent herbicide is the recommended practice for controlling Palmer amaranth in soybeans in several states rather than post-emergence applications. A comparative trial for several pre-emergent herbicides was initiated at the end of April. Alfalfa already had substantial regrowth (3-4 inches since cut) when applications were applied.

While data for efficacy longevity were unable to be obtained, data for alfalfa stem height indicated that herbicides did have some effect on alfalfa. Some phytotoxicity was noted from Sandea and Velpar, but this was expected based on product labeling and warm weather usage.

Mean alfalfa height (inches) following herbicide application on April 30, 2022, Blythe, CA.

Treatment and rate/acre	Height May 9 (9 DAT)	Height May 20 (20 DAT)	Mean growth between May 9-20
Chateau SW 4 oz.	19.4 a	27.7 bc	8.2 ab
Prowl H2O 4.2 qts.	19.3 a	27.5 c	8.2 ab
Pursuit 6 oz.	21.1 a	29.0 abc	8.0 ab
Sandea 1 oz.	13.5 c	15.8 e	2.3 c
Treflan TR-10 15 lbs.	20.7 a	29.7 a	9.0 a
Velpar DF CU 1.33 lbs	17.4 b	24.4 d	7.0 b
Warrant 2 qts	20.3 a	28.7 abc	8.5 ab
UNTREATED	20.3 a	29.2 ab	8.9 a

Means in columns followed by same letter are not statistically different at the $P < 0.05$ level (Student's T Test, JMP Pro 16.0.0).



Fig. 3. Plant height differences were still easily noted at 20 days after April 30, 2022, application. Less damage from herbicides that cause phytotoxicity is expected when applications made immediately after bales are removed.

The post emergent herbicide trial was initiated in early October 2021 using primarily combinations of a burn-down herbicide plus a second herbicide chemistry against established pigweeds in a bedded alfalfa field and evaluated effects on both pigweeds, other germinating weeds and damage/reduction in alfalfa foliage heights. Producers and growers are reminded to check the labels for usage of these products, as several chemistries in the trial were not registered for usage in California alfalfa at the time of application.

These experiments also resulted in phototoxicity of alfalfa, with differences between products easily noted at several days post application. Treatments which resulted in best efficacy of pigweeds also results in highest level of damage to alfalfa (see table on accompanying page).



Take Home Messages:

- 1) Keep Palmer amaranth from germinating in your fields (an ounce of prevention is worth a pound of cure)
- 2) Clean off swathers (and other field equipment as applicable) after it leaves field that has a Palmer amaranth infestation to prevent movement of seed from field to field
- 3) Keep seeds in your fields (don't move water from a field that has Palmer amaranth to a canal or another field as seeds are known to move with water)

Effects of various herbicides applied to alfalfa on October 6, 2021, Blythe, California

Herbicide and Rate/Acre	Water Conditioner and Rate	Surfactant and Rate	% Pigweed plants with no green structures	Green tissue and structures level (1=low, 4=high)	Mean number of annual sowthistle seedlings/ meter (furrow + bed)	Mean Alfalfa Height (inches) on October 20, 2021
Chateau SW 1 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	90.0 ab	2.7 bc	17.3 bcd	8.6 bc
Chateau SW 2 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	81.3 a-e	2.6 b	5.8 d	7.6 cd
Prowl H2O 2 qt. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	72.0 cde	2.0 bcd	13.6 bcd	7.7 cd
Prowl H2O 4 qt. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1 % v/v)	68.8 de	1.6 d	5.1 d	7.7 cd
Pursuit 3 oz. + Raptor 3 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	71.3 cde	2.0 bcd	17.9 bcd	8.0 cd
Pursuit 6 oz. + Raptor 6 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	84.2 abc	2.1 bcd	10.9 bcd	7.9 cd
Sharpen 2 oz.	K-Amino 1 lb./acre	----	75.0 b-e	2.1 bcd	29.8 b	9.3 b
Sharpen 2 oz.	K-Amino 1 lb./acre	Methylated Seed Oil (1% v/v)	83.8 a-d	1.8 cd	24.8 bcd	8.3 cd
Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	67.5 e	2.3 bcd	25.9 bc	8.0 cd
Warrant 1 qt. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	85.0 abc	1.5 d	13.3 bcd	8.1 cd
Warrant 2 qt. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	81.3 a-e	1.75 cd	6.1 cd	7.8 cd
Warrant 1 qt. + Chateau SW 1 oz. + Sharpen 4 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)	97.5 a	2.0 bcd	1.0 d	7.2 d
Zidua SC 3.25 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)			11.8 bcd	7.8 cd
Zidua SC 6.5 oz. + Sharpen 2 oz.	Quest (0.5% v/v)	Methylated Seed Oil (1% v/v)			10.1 bcd	7.2 d
Untreated	----	----	7.4 f	4.0 a	73.7 a	12.8 a

This edition of the Palo Verde Valley Update is brought to you by:

*Michael D. Rethwisch
Crop Production and Entomology Farm Advisor
UCCE-Riverside County, Palo Verde Valley Office
290 N. Broadway, Blythe, CA 92225-1649
mdrethwisch@ucanr.edu (760) 921-5064.*

AUGUST 2022 (167 cc)

The University of California, Division of Agriculture and Natural Resources (UC ANR) prohibits discrimination against or harassment of any person in any of its programs or activities on the basis of race, color, national origin, religion, sex, gender, gender expression, gender identity, pregnancy (which includes pregnancy, childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), genetic information (including family medical history), ancestry, marital status, age, sexual orientation, citizenship, status as a U.S. veteran. UC ANR policy prohibits retaliation against any employee or person in any of its programs or activities for bringing a complaint of discrimination or harassment. UCANR policy also prohibits retaliation against a person who assists someone with a complaint of discrimination or harassment, or participates in any manner in an investigation or resolution of a complaint of discrimination or harassment. Retaliation includes threats, intimidation, reprisals, and/or adverse actions related to any of its programs or activities. UC ANR is an Equal Opportunity/Affirmative Action Employer. All qualified applicants will receive consideration for employment and/or participation in any of its programs or activities without regard to race, color, religion, sex, national origin, disability, age or protected veteran status. University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's equal employment opportunity policies may be directed to: UCANR, Affirmative Action Compliance and Title IX Officer, University of California, Agriculture and Natural Resources, 2801 Second Street, Davis, CA 95618, (530) 750-1397. Email: tljordan@ucanr.edu. Website: http://ucanr.edu/sites/anrstaff/Diversity/Affirmative_Action/.

For local inquiries call 760-921-5060 (UCCE Riverside County- Palo Verde Valley office) or contact the UCCE-Riverside Moreno Valley office at 951-683-6491.