

The Impacts of Palmer Amaranth in CA Alfalfa Production

Jorge Angeles

UCCE Weed Management Advisor

Tulare, Kings and Fresno Counties.

Outline

- Biology and Distribution
- Why Palmer amaranth is of Concern in Alfalfa Production?
- Herbicide Use and Glyphosate Resistance
- Management Options



Palmer Amaranth (*Amaranthus palmeri*)

- Amaranthaceae Family
- Summer Annual Weed
- Classified among the top 5 worst weeds in US agriculture by the Weed Science Society of America (WSSA).
- Rapid Growth: Can grow up to 6-8ft tall.
 - 1-2 in/day
- Prolific seed producer – 200,000– 600,000 seeds per female plant



Common Waterhemp



- Long, narrow, smooth, shiny, dark oblong green leaves
- Shorter Petioles, shorter than leaf blade
- Stems are hairless. (green or red)
- Bracts absent.



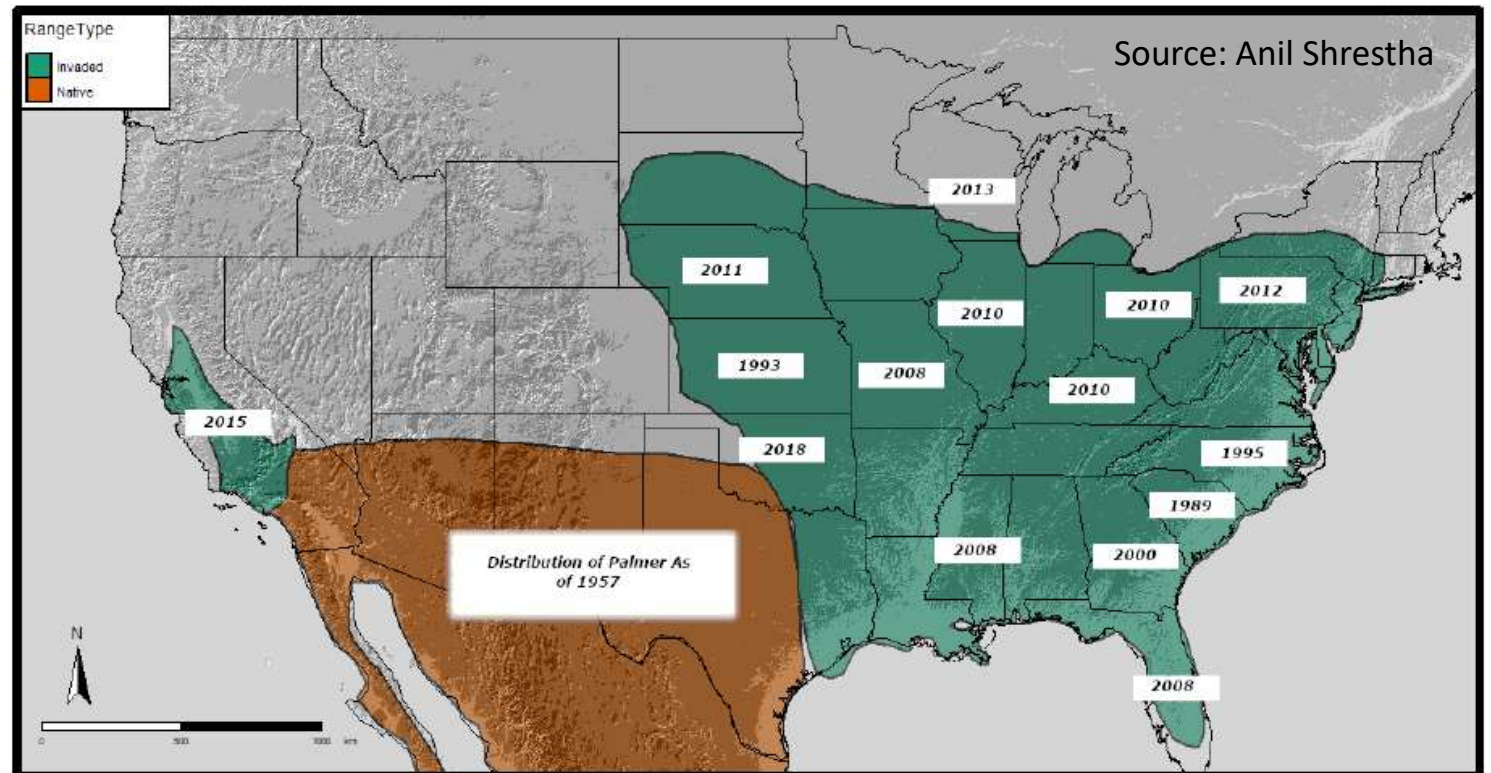
Pictures: Lynn Sosnoskie

Palmer Amaranth



- Diamond shaped leaves.
- Sometimes has silver watermark.
- Petioles are longer than leaf blade.
- Stems are hairless. (green or red)
- Sharp Bracts. (Female Plants)

Palmer Amaranth Distribution



- Can be found in different parts in California.
- Has found success in cropping systems in the San Joaquin Valley as some herbicides have become ineffective.

- Started in the desert Southwest and has moved into the northeastern and Mid West.
- Green shaded areas are marked with the year that the first herbicide resistant biotype was detected.

Why Palmer Amaranth is of Concern in Alfalfa Production?

- Palmer heavily competes with alfalfa.
 - Nutrients and Water.
- Can reach heights of 6-8 ft.
- High prolific seed production
 - Seeds viable for several years.
- Weedy alfalfa is less desirable to buyers.
- Increases the time of curing which can result in few harvest in a year.
- **Glyphosate Resistant Palmer Amaranth in California**
- **Has developed resistance to dinitroanilines, photosystem II-inhibitors, ALS-inhibitors, 4-HPPD-inhibitors and glyphosate in different parts of the United States.**



- Since 2012, growers in California's San Joaquin Valley (SJV) had observed poor control of Palmer amaranth in glyphosate-tolerant corn (*Zea mays* L.) and cotton (*Gossypium hirsutum* L.).



Kings Co. 2013



Tulare Co. 2012

Glyphosate Resistant Palmer Amaranth

- In 2015, Glyphosate-resistant populations of Palmer amaranth were confirmed in California.
 - Confirmed in 29 other states in the U.S since 2005.



Sonia Rios, Anil Shrestha, Steve Wright – Fresno State



Palmer amaranth population in Alfalfa in the low desert
Picture: Michael Rethwisch – UCCE Palo Verde Valley



Palmer amaranth weed escapes in RR Alfalfa in Tulare Co

Palmer Amaranth Management Options in Alfalfa

- Weed control options are limited.
- Palmer amaranth will regrow from stalks when alfalfa is mowed.
 - Can decrease seed production.
- Only a few post emergence herbicides have activity on Palmer amaranth.
 - Limited options for Glyphosate Resistant Palmer amaranth.
 - Timing is critical
- Pre-emergence herbicides applied during the fall and winter do not persist long enough to control Palmer amaranth in the summer.
 - Depends where you are geographically.

Major Herbicides in Established Alfalfa

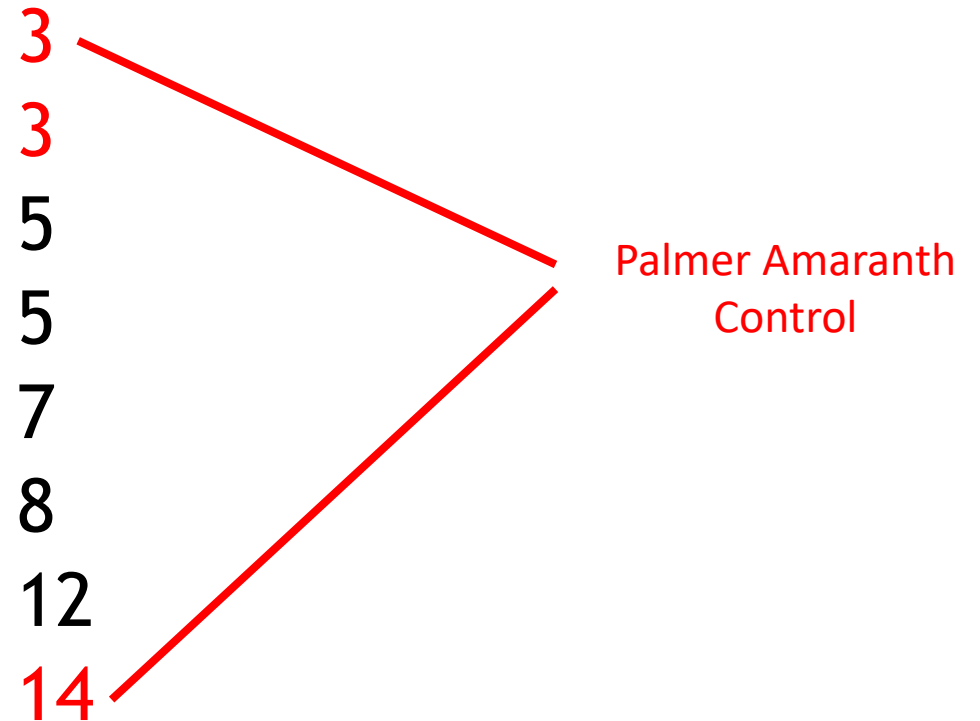
• Preemergence	Group No.
• Pendimethalin (Prowl H2O)	3
• Trifluralin (Treflan)	3
• Hexazinone (Velpar)	5
▪ Metribuzin (Tricor)	5
• Diuron (Karmex)	7
• EPTC (Eptam)	8
• Norflurazon (Solicam)	12
• Flumioxazin (Chateau)	14

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Group No.



Major Herbicides in Established Alfalfa

• Postemergence	Group No.	Timing
• Clethodim (Select Max)	1	
• Sethoxydim (Poast)	1	
• Halosulfuron (Sandea)	2	
• Imazamoz (Raptor)	2	
• Imazethapyr (Pursuit)	2	
• 2,4-DB (Butyrac 200)	4	Dormant
• Hexazinone (Velpar)	5	Dormant
• Glyphosate (Roundup Powermax)**	9	
• Carfentrazone (Shark EW)	14	
• Saflufenacil (Sharpen)	14	Dormant
• Paraquat (Gramoxone SL 2.0)	22	Dormant

**only Roundup Ready varieties and Pre-Plant

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Control
Palmer
Amaranth

** only Roundup Ready varieties and Pre-Plant

Mortality of Palmer amaranth plants at three different growth stages with different herbicides

Treatment	Rate	4- to 6-leaf stage	8- to 10-leaf stage	12- to 16-leaf stage
		% control		
Saflufenacil (Treevix)	1 oz/ac	100a	100a	100a
Glyphosate	22 fl oz/ac	96a	68b	43b
Paraquat	1 pt/ac	100a	100a	100a
Glufosinate	29 fl oz/ac	100a	39c	20c
Rimsulfuron	1 oz/ac	84a	86a	67b

Study by: Sonia Rios, Anil Shrestha, Steve Wright

Treatments with Saflufenacil (Sharpen)

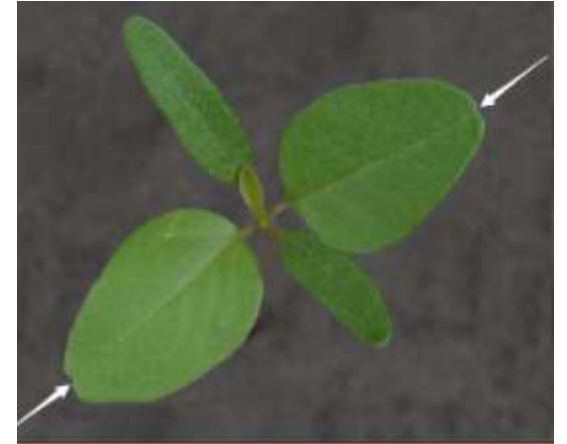


Treatments with Saflufenacil (Sharpen)



What can be done to Manage Palmer Amaranth?

- Weed Identification
- Prevent the introduction of palmer in new fields.
 - Equipment Sanitation
 - Control Palmer in field borders and irrigation canals.
- Post-emergence herbicide applications at the proper timing
 - 4-6 leaf stage.
- Drying out field between cuttings can suppress summer annual weeds.
 - Can impact yield.



What Can be Done to Manage Palmer Amaranth?

- Split applications of Pendimethalin (Prowl H2O) and tank mix combination of Pendimethalin and Flumioxazin (Chateau) have been known to reduce pigweed populations.
 - Depends on the area.

- Applications of Raptor and Glyphosate can be effective at reducing palmer amaranth populations.
 - Small weeds

Integrated Management Approach to Reduce Risk for Herbicide Resistance

- Rotation of herbicides with different Modes of Action (MOA)
- Herbicide Tank Mixes with complimentary MOAs
 - Tank-mix glyphosate with residual herbicides
- Manage weed escapes
- Crop Rotation
- Avoid Weed Shifts
 - Avoid continuous RR Crops (corn, sugarbeets, or cotton)
 - Avoid using glyphosate alone to control weeds.

Conclusions

- **Palmer amaranth is becoming a problem in alfalfa production and other cropping systems throughout California.**
 - There are concerns of it developing to resistance to glyphosate and other herbicides in other regions.
- **No simple herbicide solution to control palmer in alfalfa.**
 - Pre and post emergence applications
- **Need to use all the available tools to control palmer amaranth.**
 - Reduce the risk of herbicide resistance.
- **May need to consider burndown herbicide applications mid season to control heavy palmer amaranth populations in alfalfa.**

Where to find information:

- <http://ucipm.ucdavis.edu>
 - IPM practices, herbicide treatment tables, scouting
- <http://wric.ucdavis.edu>
 - Weed/herbicide charts, weed topics, research, etc.
- <http://www.weedscience.com>
 - Weed resistance, herbicide MOA
- <http://www.cdms.net>
 - Pesticide labels

Jorge Angeles

Email: jangeles@ucanr.edu

Phone: 559-684-3300