

Managing Burrowing Rodents in Walnuts—What's New?

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Carbon Monoxide Machines

- Legalized in CA since January 1, 2012.
- Potential advantages for CO:
 - Safer for use
 - Multiple applications
- Will now be regulated by CDPR.



Carbon Monoxide Machines

Species	Device	Authors	# of fields	Efficacy
Pocket gopher	PERC	Orloff	3	56%
Pocket gopher	PERC	Baldwin & Orloff	3	62%
Pocket gopher	PERC	Baldwin & Orloff	2	68%
Belding's GS	PERC	Orloff	2	76%
California GS	PERC	Baldwin	2	66%
California GS	PERC	Baldwin	2	100%
California GS	Cheetah	Baldwin	3	-7%

Carbon Dioxide

- The Eliminator by IGI, LLC not yet approved for use.



Carbon Dioxide

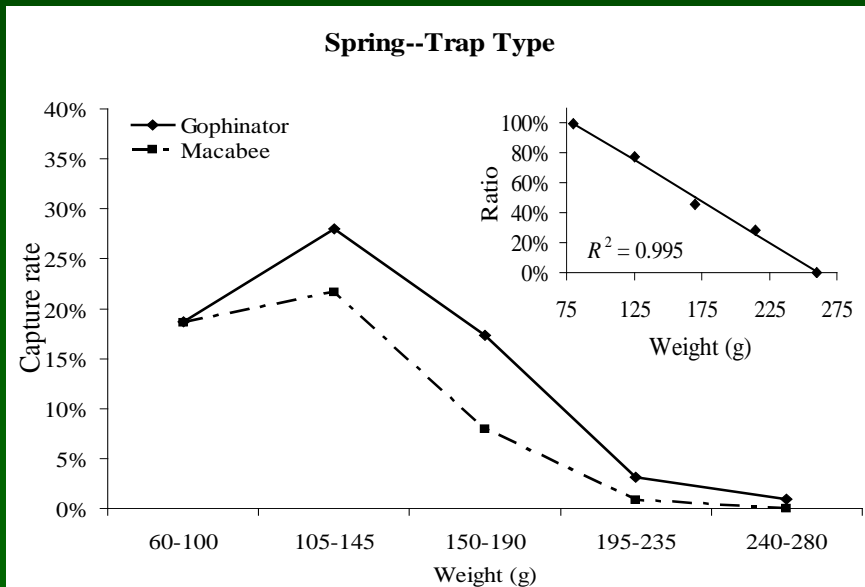
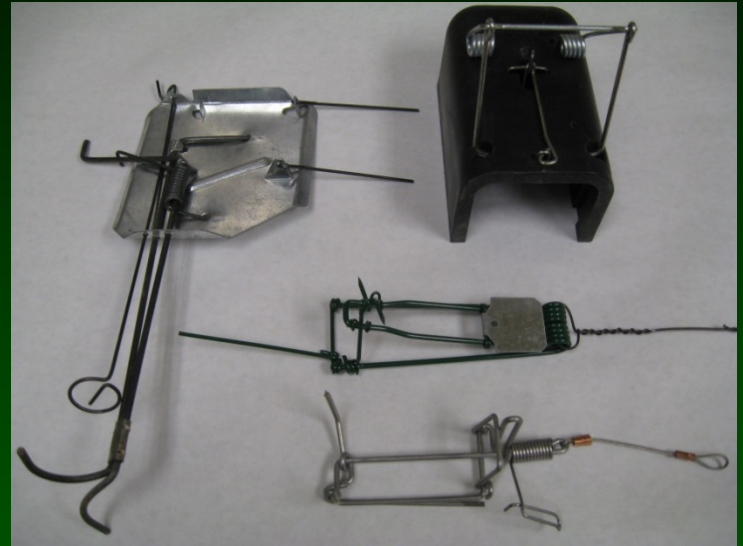
- The Eliminator by IGI, LLC not yet approved for use.
- Dry ice approved for rats, but not ag fields.



Trapping—Options

Pocket gophers

- Gophinator trap was more effective than Macabee trap.
- Captured heavier gophers at a greater rate.



Trapping—Options

Pocket gophers

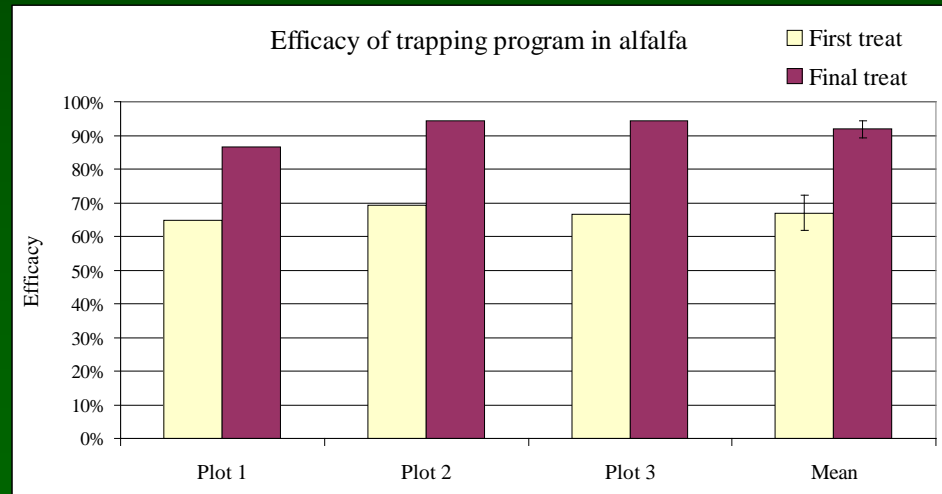
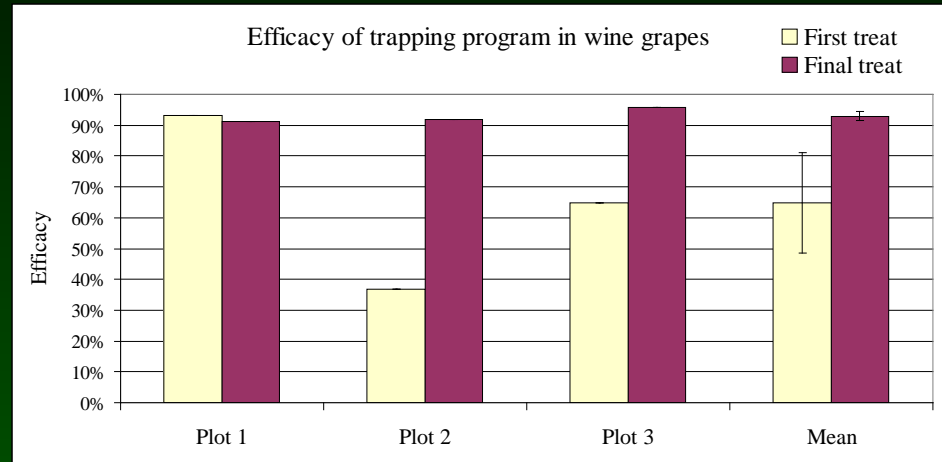
- Covered sets yielded slightly higher capture rates in spring-summer, but not autumn.
- Efficacy was offset by setting time.
- We did not observe a difference in the number of captures across attractants.
- Human scent had no effect.



Trapping—Efficacy

Pocket gophers

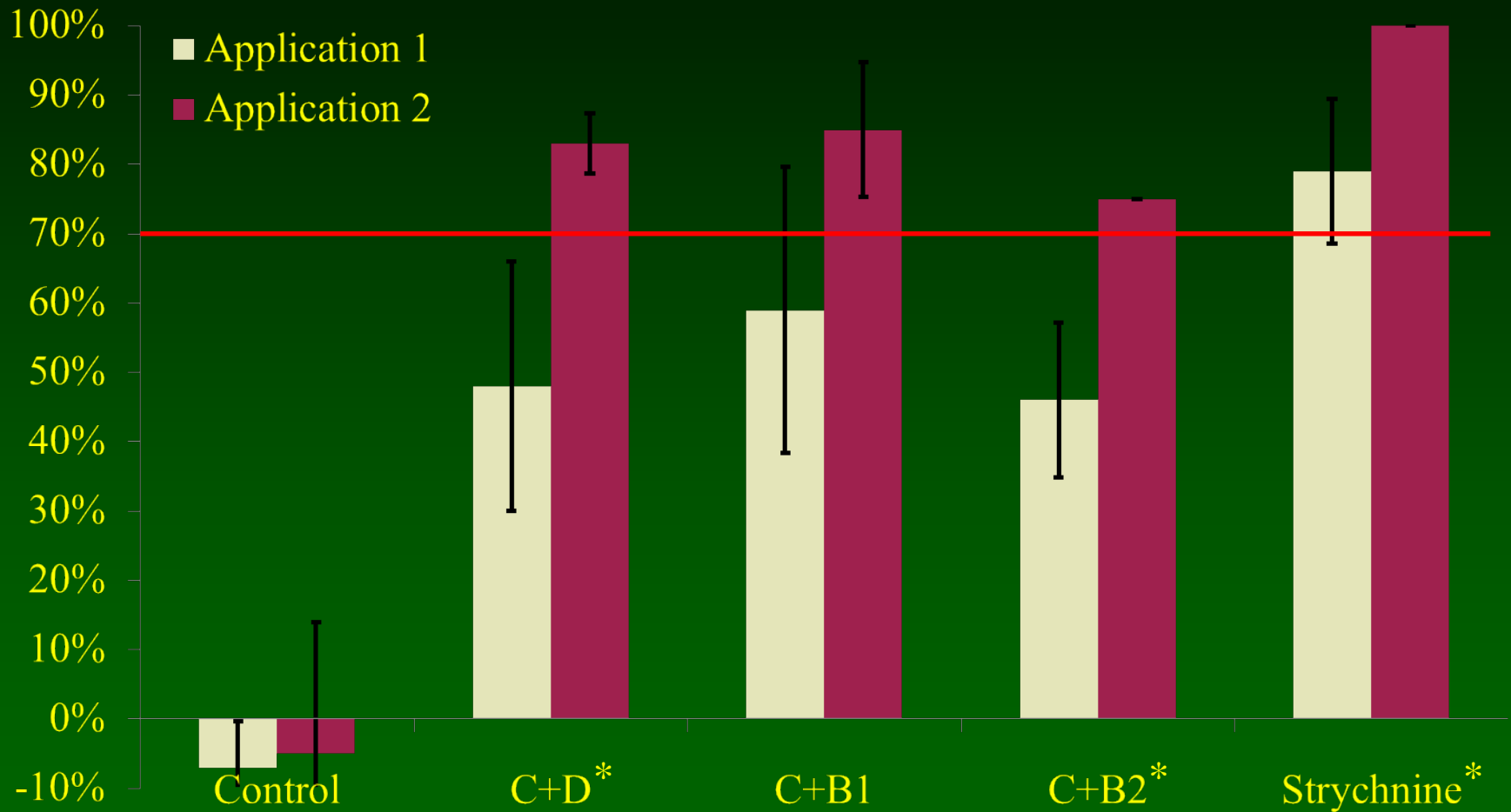
- Exhibited high efficacy in wine grapes after two treatments.
- Exhibited high efficacy in alfalfa after two treatments.



Pocket Gopher Rodenticides

Product	AI	Carrier	S. Rosa	Pala	Total
Control	Maintenance diet	Rat chow	1/10	0/10	5%
CDFA	Chlorophacinone (0.01%)	Oat grain	3/5	2/5	50%
Rozol	Chlorophacinone (0.005%)	Wheat grain	3/5	2/5	50%
Wilco D	Diphacinone (0.005%)	Milo grain	-----	0/5	0%
RCO Patrol	Diphacinone (0.005%)	Pellet	1/5	2/5	30%
Wilco ZP	Zinc Phosphide (2.0%)	Wheat grain	2/5	3/5	50%
Bell ZP	Zinc Phosphide (2.0%)	Pellet	4/5	0/5	40%
Omega	Strychnine (0.5%)	Oat grain	5/5	0/5	50%
Avalon	Strychnine (0.5%)	Mixed grain	5/5	1/5	60%
Bromethalin	Bromethalin (0.01%)	Milo grain	-----	0/10	0%
Terad ₃	Cholecalciferol (0.075%)	Pellet	-----	2/5	40%
C+D	Chole (0.03%) + Diph (0.005%)	Pellet	5/5	3/5	80%
C+B 1	Chole (0.03%) + Brod (0.0025%)	Pellet	-----	5/5	100%
C+B 2	Chole (0.015%) + Brod (0.0025%)	Pellet	5/5	5/5	100%
C+B 3	Chole (0.015%) + Brod (0.00125%)	Pellet	-----	6/10	60%

Pocket Gopher Rodenticides

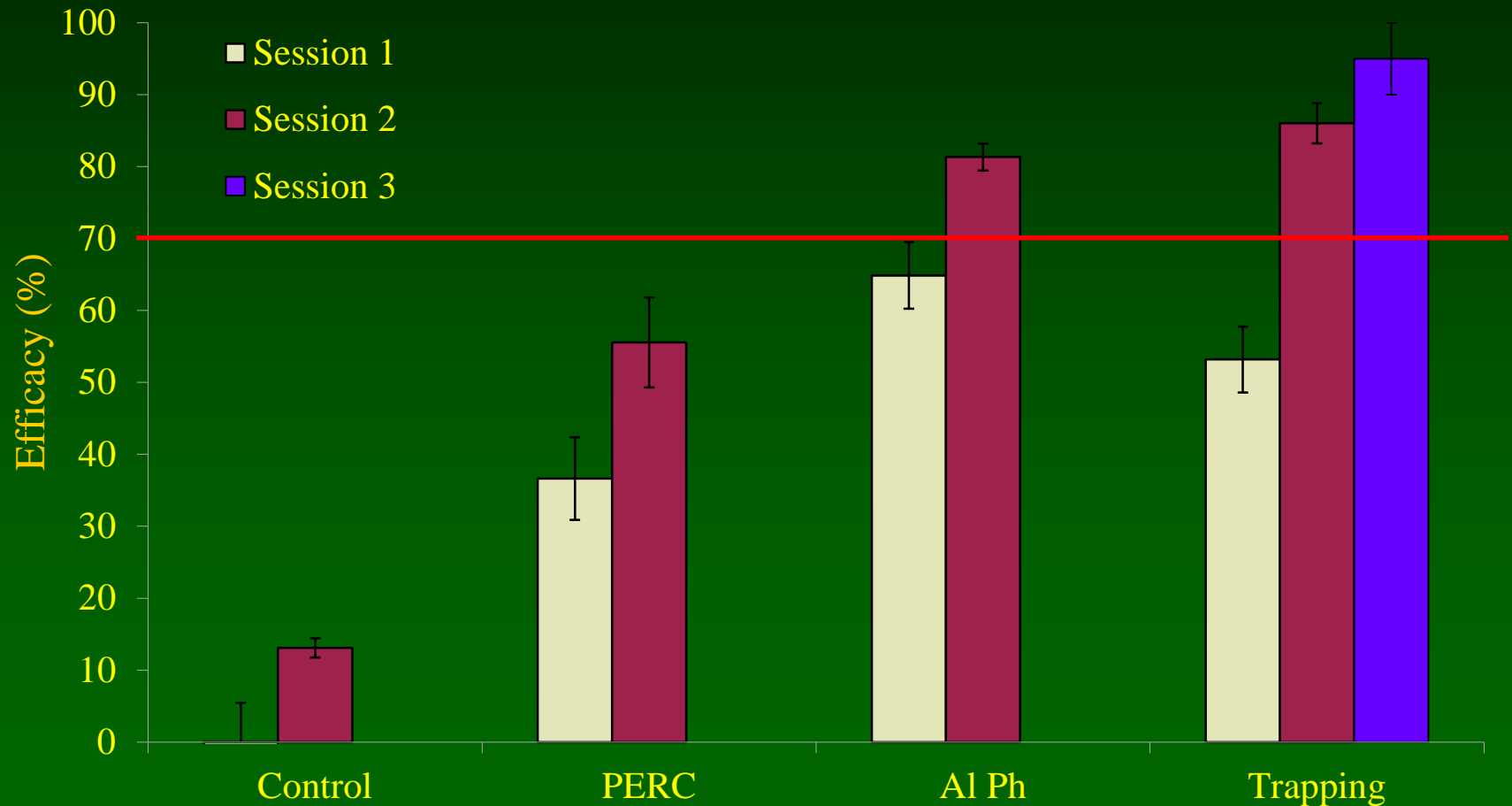


* Significantly $> 70\%$; $P < 0.10$.

- C+B1 may still be worth pursuing.

Control Options—Comparisons

- Trapping and aluminum phosphide were most effective for gophers.



Roof Rats and Deer Mice

- Study showed 0.005% diphacinone grain effective (90%) against roof rats in almonds.
- Must be used during non-bearing season.
- Also highly effective on deer mice (99%); research resulted in getting deer mice added back to label.



Repellents

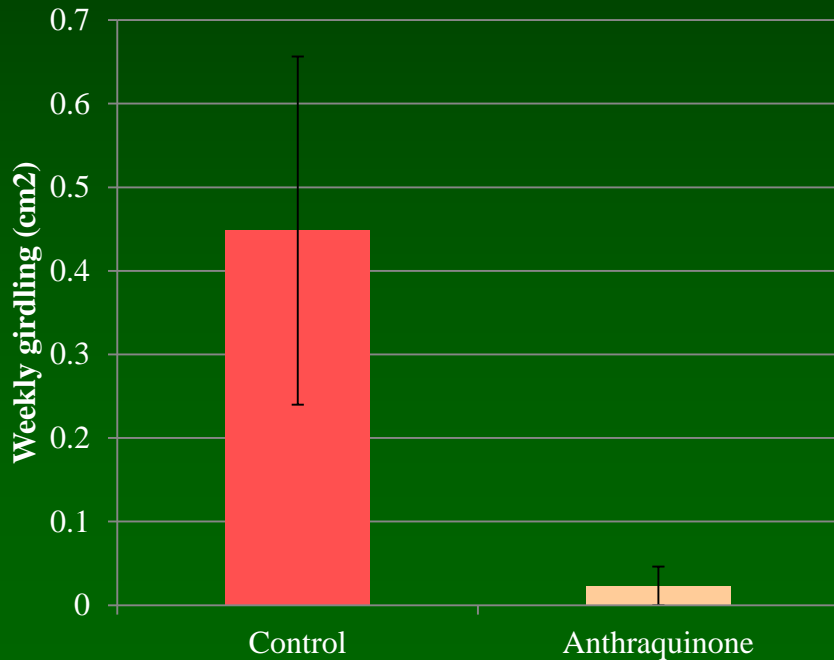
- rely on objectionable odors or unpleasant tastes/responses.
- commonly available but none proven effective.
- anthraquinone may show some promise.



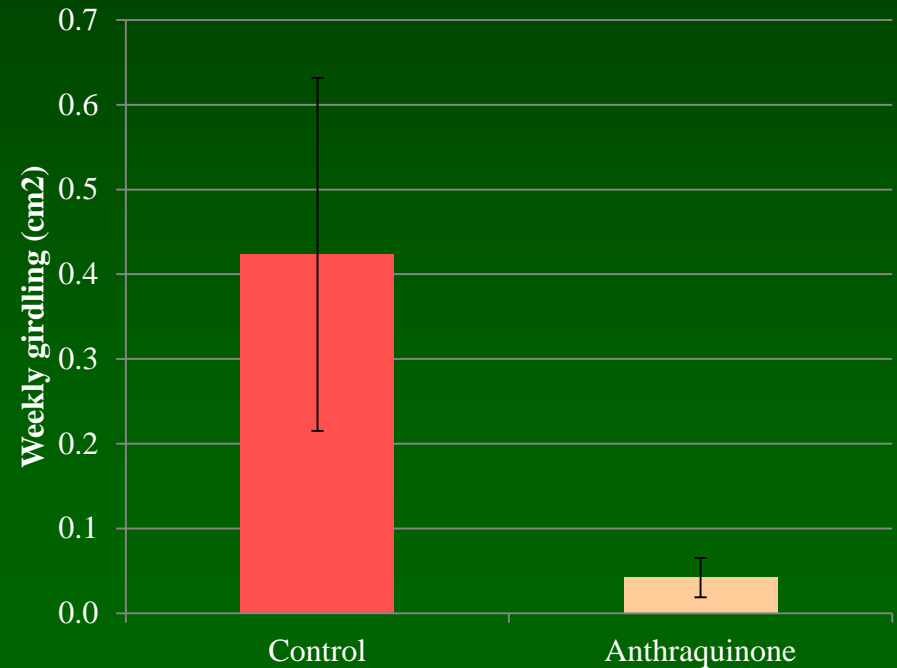
Repellents

- Anthraquinone reduced damage
 - summer: control: 0.45 cm², anthraquinone: 0.02 cm²; $P < 0.001$
 - spring: control: 0.42 cm², anthraquinone: 0.04 cm²; $P < 0.001$

Summer



Spring



Shooting

- Shooting can be effective for controlling ground squirrels although it is labor intensive.
- Lead bullets are no longer allowed in California Condor range and banned statewide starting 2019.



A photograph of a squirrel sitting on a bed of dry grass and twigs. The squirrel is facing left, with its paws near its mouth. To its right is a large white PVC pipe. In the background, there are dark, rocky hills under a clear sky. A speech bubble is positioned above the squirrel, containing the word "Questions?".

Questions?