

Slug Control Efforts in Hawaii

Slugs and Snails - Biology and Control

San Marcos Community Center

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Arnold H. Hara

University of Hawaii at Manoa

Dept. of Plant & Environmental Protection Sciences

Hilo, Hawaii arnold@hawaii.edu



Pestiferous Snails and Slugs in Hawaii



Cuban slug, *Veronicella cubensis*



Semislug, *Parmarion martensi*



Tornatellides sp., a native cone spiral shell snail on foliage <math><1/4</math> inch in length



Zonitoides arboreus, an alien flat spiral shell snail on foliage and roots of plants. <math><1/4</math> inch



Giant African Snail, *Achatina fulica*

Marsh slug,
Deroceras laeve



Meghimatium striatum



- *These are primarily quarantine pests with some damage to ornamentals.
- *All snails and slugs in Hawaii is capable of carrying the larvae of the parasitic nematode, the rat lungworm, that can cause eosinophilic meningitis in humans by eating slug contaminated raw vegetables.
- *High rainfall (133 in per year) encourages high snail/slug populations & lessens effectiveness of slug baits.
- *Hawaii has a rich native snail fauna; therefore, biological control must be species specific.

Control of Slugs

- *Copper and copper hydroxide are known to be repellent and toxic to snails and slugs.
- *Snails and slugs are effectively controlled with bait and metaldehyde as the toxicant (Deadline, Metarex).
- *Metaldehyde granules (Durham 7.5G) and liquid Slugfest are effective against orchid or bush snail.
- *Other liquids, Imidan (OP) and Mesuro 75WP (RUP) also effective.



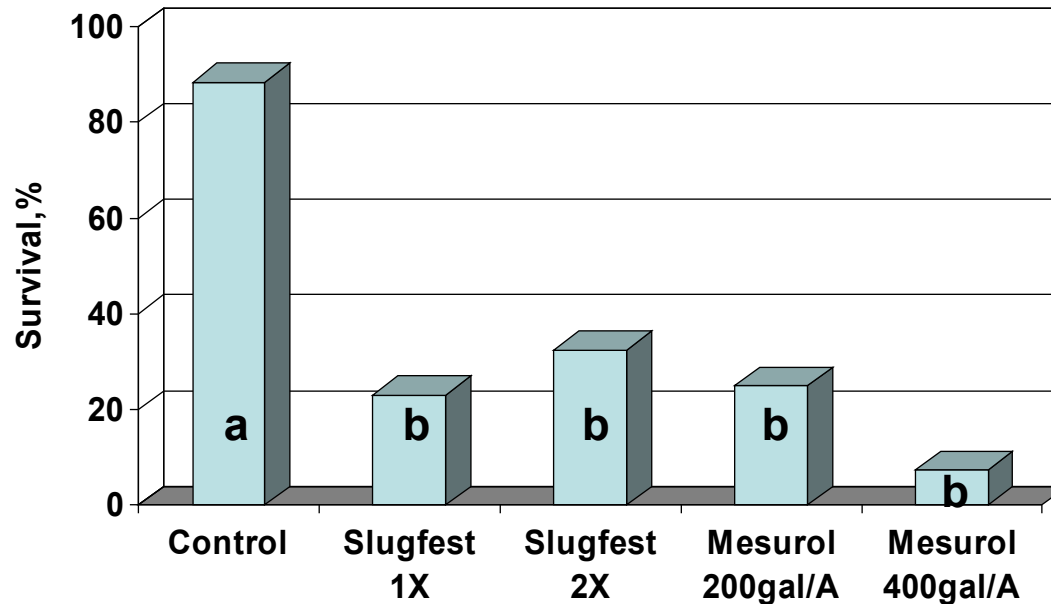
Copper hydroxide in latex paint (SpinOut)

Treatment	\bar{x} + SD slugs / pot
1 DAT	
Spin Out	1.0a ± 0.9***
Control	15.0b ± 5.2
4 DAT	
Spin Out	0.0 ± 0.0
Control	24.1 ± 10.4
8 DAT	
Spin Out	0.1a ± 0.3**
Control	16.9b ± 9.1

Significant by t test (**, ***, P < 0.01, 0.0001, respectively).

Orchid or bush snail: *Zonitoides arboreus*

Survival of Snails in Media of Pots



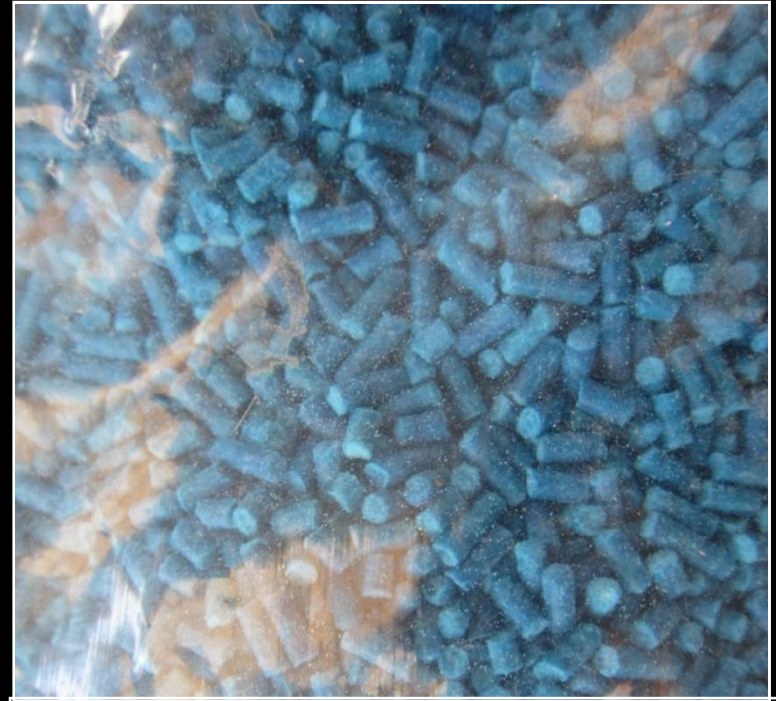
Treatments significantly reduced snail survival (Tukey's multiple comparison procedure $P < 0.05$). Slugfest was applied at 4 or 8 qts in 400 gal/A. Mesuroil was applied at 2lb/100gal with outputs of either 200 or 400 gal/A.

Metarex



- *4% metaldehyde
- *Wet-process technology provides superior weatherability, uniformity, palatability and control.

Deadline T & O



- *4% metaldehyde
- *Rain fast, and can withstand as much as 6 inches of rain or heavy watering over 14 days..

Slug and Snail Baits Weathered 7 Days

4 inches of rainfall under shadehouse Avg. Temp 76 F

Metarex

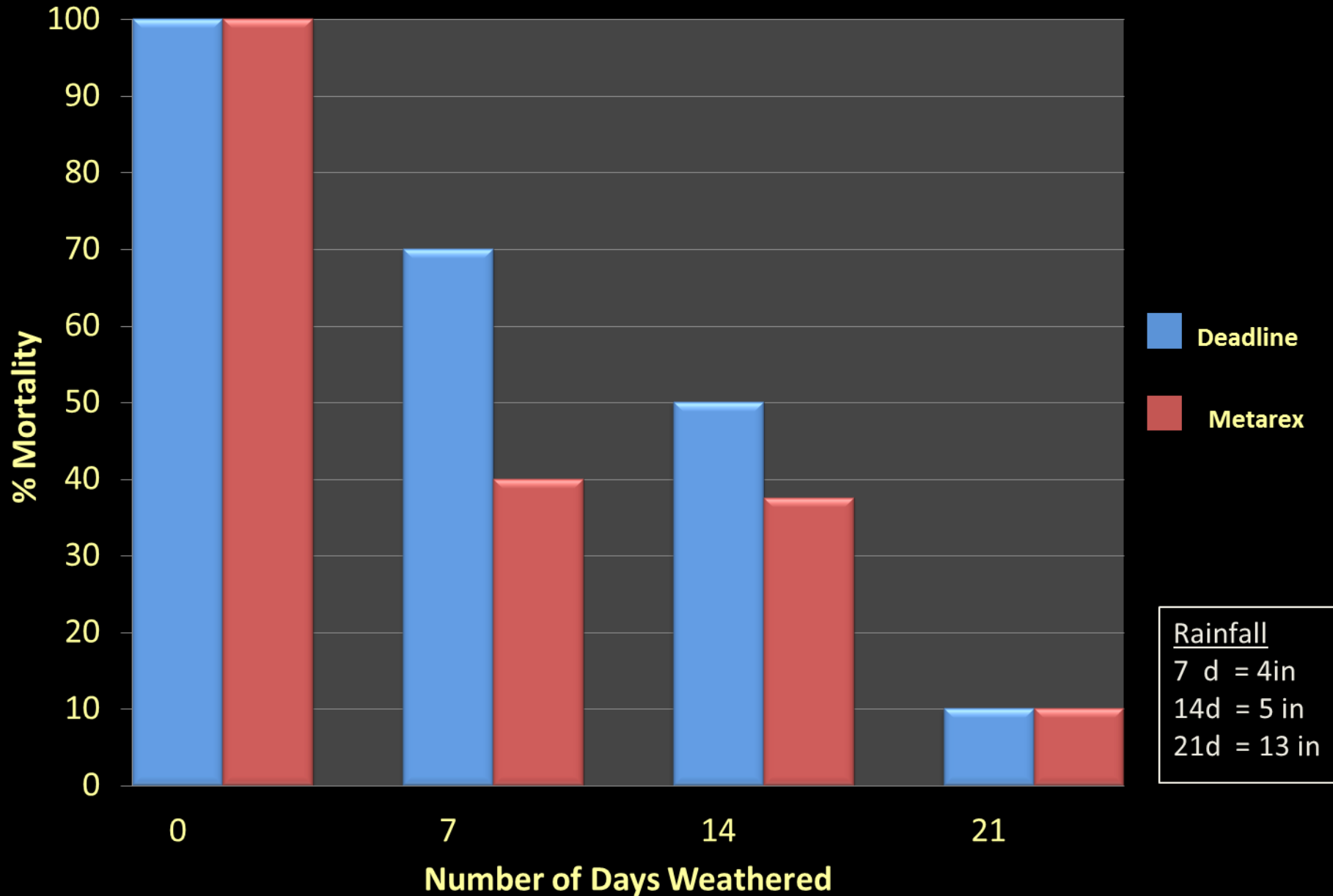


Deadline



Applied at 40 lbs/Acre

Mortality of *Veronicella cubensis* Exposed for 3 Days to Weathered Metaldehyde Baits



Slugs intercepted in X-Mas Tree Shipped from Oregon to Hawaii Nov. 2011



Photos by L. Iseke HDOA



**118 F @ 8 min
Effective in
killing slugs
HDA**

Douglas Fir trees 22 days after hot shower treatment at 118 F for 8 min. No significant heat damage observed.

30 to 40 trees hot showered in a 24 ft treatment insulated freight container.



Treatment chamber delivers 105°-120° F recirculating hot water at 50 gpm thru 110 full cone nozzles.

Trees from Oregon/Washington
Nov.-Dec. 2012

*Slug species:

Arion hortensis

Deroceras laeve

D. reticulatum

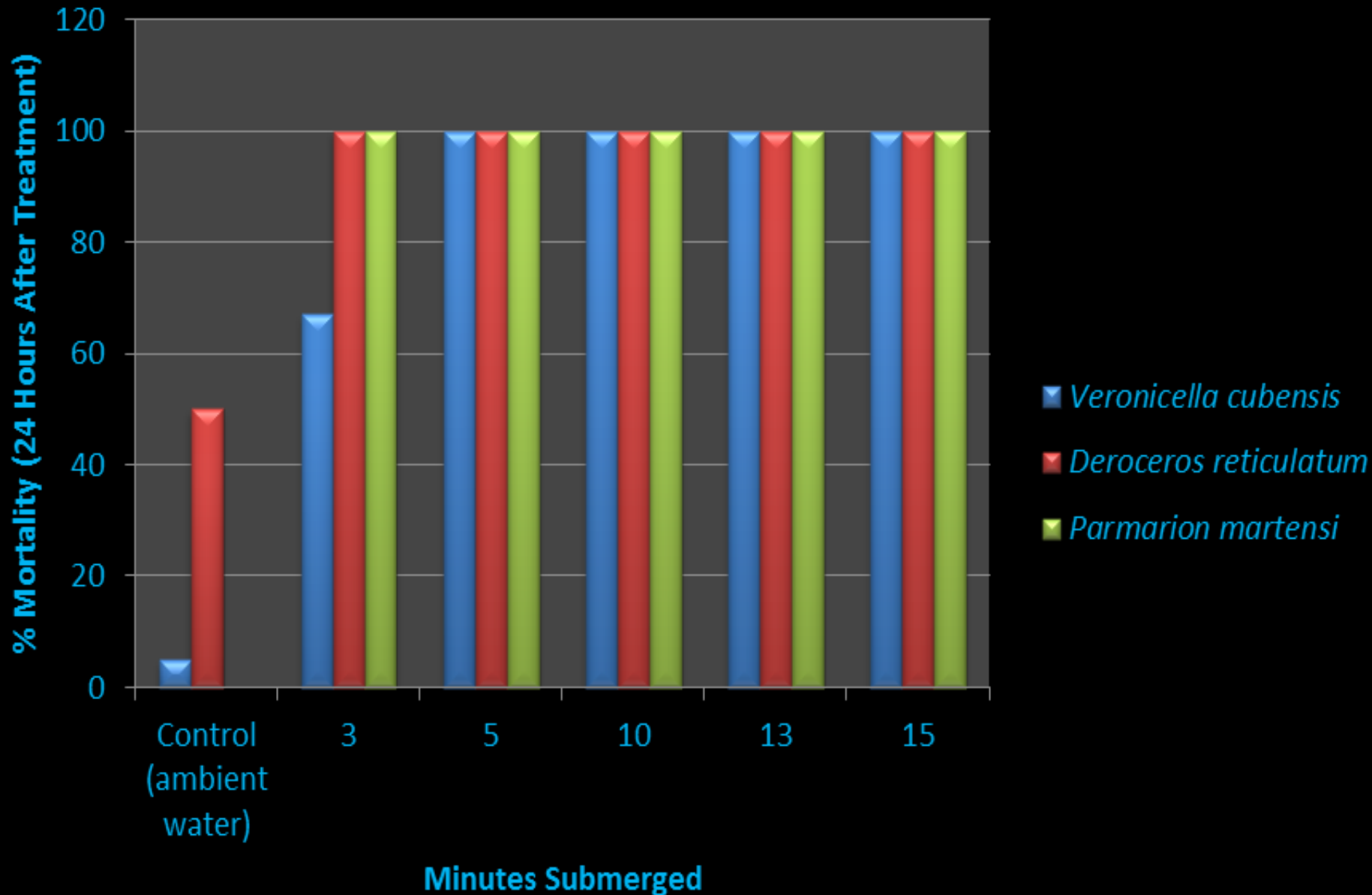
D. caucasicum

D. panormitanum

*15,000 trees were treated in hot water shipped ca. 35 40 ft. freight containers.



Efficacy of Hot Water (113°F) Against Slugs



Oncidium

Hot Water drench
at 113°F for 5 min

No damage
4 weeks after treatment
Effective in controlling
bush snails.



Summary

- *Invasive slugs and snails are major quarantine pests in Hawaii.
- *Several species cause serious damage to food crops and ornamentals.
- *All snails/slugs in HI are capable of carrying the rat lungworm.
- *Biological control of snails and slugs needs to be specific because of our native fauna of snails.
- *Copper hydroxide is highly repellent to slugs.
- *Metaldehyde baits are effective but high rainfall causes baits to mold.
- *Hot water at 113° to 118° F will control most species of slugs and not damage most tropical plants and firs as Christmas trees.

THANK YOU!

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