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Using Seaweed to Deliver Liquid Ant Baits

Argentine ants can be a damaging ant pest species in both agricultural and urban environments in California. Outdoors, they disrupt biological control by tending honeydew-producing pests and protecting them from natural enemies. Argentine ants are also common invaders of urban residential settings, making them the nuisance ant species most often treated by pest management professionals (PMPs).

Contact insecticide sprays are frequently used control options for Argentine ants due to practical advantages, such as easy application and relatively quick suppression of ant pest populations. In urban settings, sprays containing phenylpyrazole (i.e., fipronil) and various pyrethroids (e.g. deltamethrin, permethrin) are often used by PMPs to control these pests. When applied to hardscapes, these pesticides can run off into storm drains, and some of these insecticides are detected in urban waterways. For more details about pesticide runoff, see the [June 2010](#) and [July 2010](#) issues of the *Green Bulletin*.

Application restrictions

In an effort to reduce pesticide runoff, in 2012 the California Department of Pesticide Regulation (DPR) issued restrictions for pyrethroid use on hardscapes by licensed professionals. In addition, the U.S. Environmental Protection Agency approved new label amendments in April 2017 for fipronil products that will significantly change the way PMPs can apply fipronil in outdoor settings for Argentine ant control (see the fipronil article on page 2). While it is not yet known how these new changes will reduce off-site pesticide contamination, it is a good time to start investigating effective alternatives for ant control.

Improving baiting

Baiting with sugar-based liquid baits has been shown to be an effective control method for Argentine ants but requires bait stations to store and dispense the bait. Bait stations can be expensive and labor-intensive to maintain. To overcome these challenges, a group of researchers at UC Riverside—Drs. Jia-Wei Tay, Mark Hoddle, Ashok Mulchandani, and Dong-Hwan Choe—developed a natural hydrogel matrix to deliver liquid ant baits (Figure 1). The use of hydrogels may allow practitioners to apply liquid bait directly to the surface of the ground where ants forage without the need for a bait station.



Figure 1. Argentine ants feeding on green or red hydrogels to demonstrate liquid bait uptake.

What is hydrogel and how does it work?

Beads of alginate hydrogel, derived from seaweed, were mass-produced using a modified shower head nozzle (view the 11-minute video at youtu.be/NVMql2xClBk or the 36-second video at youtu.be/CwDB8uyCCmg). The hydrogel beads were conditioned for 24 hours in a liquid bait solution made up of 25% sucrose and a small amount (0.0001%) of the insecticide active ingredient thiamethoxam. This amount of thiamethoxam is significantly less than the percentage found in current commercial ant bait products. The highly absorbent hydrogel acts as a controlled-release formulation that keeps the liquid bait available and attractive for an extended period. The team determined the hydrogel's properties such as water uptake and water loss characteristics, pesticide intake, and the acceptance by foraging

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Argentine ants. In small-scale laboratory tests, the hydrogel bait provided excellent control against all stages (e.g., workers, brood, and queens) of the Argentine ant colony within 14 days.



J-W TAY, UCR

Figure 2. Applying hydrogel bait around a home.

Field results and future uses

To determine the efficacy of the alginate hydrogel bait in urban areas, it was field-tested around residential homes in the summer of 2016 (Figure 2). Argentine ant activity levels were estimated by consumption of a sucrose solution put out in monitoring vials over a 24-hour period. Based on the monitoring data, hydrogel bait containing 0.0001% of thiamethoxam provided a 79% reduction in ant activity 8 weeks after treatment.

In 2017, the team coordinated field trials to evaluate the effectiveness of alginate hydrogel baits in controlling Argentine ant populations in commercial citrus groves. While this bait delivery system is currently only experimental, the research team hopes to find a pesticide manufacturer interested in commercializing this

patent-pending technology to provide a highly-efficient, low-impact outdoor baiting option for Argentine ants and other sugar-seeking pest ant species.

Reference:

Jia-Wei Tay, Mark Hoddle, Ashok Mulchandani and Dong-Hwan Choe. 2017. Development of an alginate hydrogel to deliver aqueous bait for pest ant management. *Pest Management Science* 73: 2028-2038. (onlinelibrary.wiley.com/doi/10.1002/ps.4616/full)

—Jia-Wei Tay, Entomology, UC Riverside, jiawei@ucr.edu

—Dong-Hwan Choe, Entomology, UC Riverside, donghwan.choe@ucr.edu

New Fipronil Label Protects Water

New label changes will alter how fipronil is applied by pest management professionals (PMPs) in urban environments, particularly between November and February, during California's typical rainy season (Figure 1).

Concerns over continued detections in urban watersheds of fipronil, a broad-spectrum insecticide commonly used against ants and other pests, led to the California Department of Pesticide Regulation (DPR) asking certain pesticide manufacturers to modify the labels of liquid formulations of fipronil to reduce negative impacts of this pesticide on the environment. These use restrictions apply to surface applications along foundation perimeters of structures.

Two nationwide changes to labels of liquid fipronil products were approved by the U.S. Environmental Protection Agency in April 2017, with the goal of keeping this active ingredient out of watersheds.

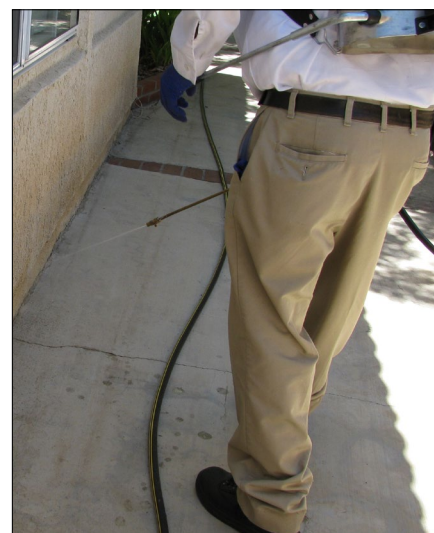
These new restrictions are:

- Do not allow application to enter or runoff into storm drains, drainage ditches, gutters, or surface waters.
- Do not apply directly to sewers or drains, or to any area like a gutter where drainage to sewers, storm drains, water bodies, or aquatic habitats can occur, except as directed by this label.

Pre- or post-construction subsurface termite treatments and bait formulations are exempt from the new limitations.

California-specific label changes

In addition to the nationwide label amendments, there are some California-specific label changes. These came about through discussions among DPR, the Pest Control Operators of California (PCOC), the registrants of Termidor SC and Taurus



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Figure 1. A pest management professional making a liquid application of fipronil.

SC, and the University of California, Riverside. The California-specific amended label was accepted by DPR in November 2017.

In California, surface applications of liquid fipronil products along foundation perimeters of structures

New Fipronil Labels *...continued from page 2*

Table 1. Restrictions to surface-applied liquid fipronil applications in California.

When	Where	How
<p>Applications prohibited on any date between November 1st and February 28th.</p> <p>Maximum of 4 applications per year.</p> <p>Minimum of 60 days between applications.</p>	<p>Do not apply to garage doors, driveways, vertical surfaces above driveways and garage doors, or to cracks and crevices leading to or adjacent to driveways (such as the expansion joint between driveways and garages).</p> <p>Do not apply spray bandwidth at greater than 6 inches out or up from where the foundation meets the ground.</p>	<p>For foundation exterior perimeter treatments, apply the product as a low-pressure (25 PSI or less at the nozzle) coarse general surface spray (must be limited to 6 inches out and up, as above).</p> <p>Only the 0.03% dilution rate may be applied, at 1 quart per 160 feet.</p>

will be further restricted as noted in Figure 2 and Table 1.

While not new, it is worth pointing out that no applications should be made during active precipitation. The Taurus SC label also states **not to apply** when rain is predicted within 48 hours post-application.

Research

UC Riverside considered these application restrictions in an applied research project and concluded that there were no significant effects on

pest control efficacy for Argentine ants and that the runoff potential was low. During field efficacy trials conducted by PCOC using these new restrictions, there were no noticeable changes in callbacks observed.

Can I use products with the old label?

Containers with the revised label have been available in California since December 2017. According to California law, registrants can continue selling product with the old

label until October 2019, which is 18 months after the US EPA's acceptance of the new label. Enforcement of product labels is based on the actual product label in hand. If an applicator legally obtained a product with the old label, then they can continue to use it under those label directions.

The new label restrictions for structural perimeter applications of liquid formulations are hoped to reduce the amount of fipronil detected in urban surface water systems.

—Belinda Messenger-Sikes,
UC Statewide IPM Program,
bmsikes@ucanr.edu

—Karey Windbiel-Rojas,
Area IPM Advisor,
Sacramento, Solano,
and Yolo countries,
kwindbiel@ucanr.edu

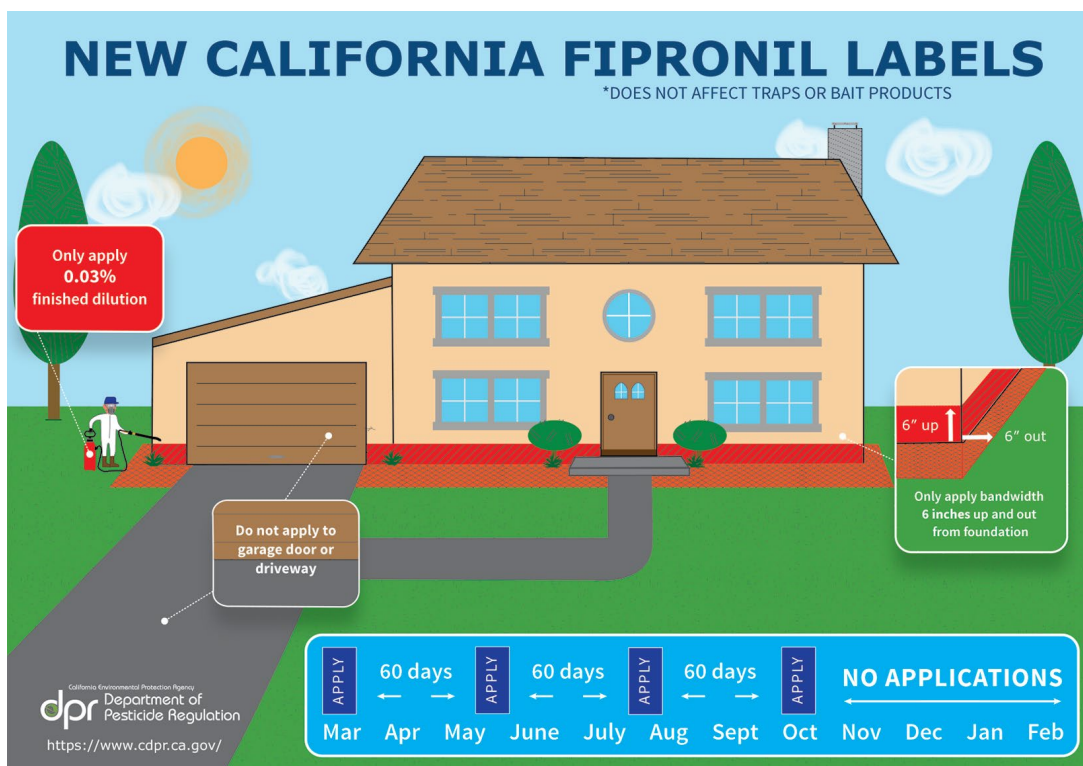






Figure 2. Diagram showing California fipronil label restrictions. Graphic courtesy of the California Department of Pesticide Regulation.

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Investigating the Pathways of Rodenticide Movement in Urban Wildlife

Rodenticides continue to come under scrutiny in California due to issues surrounding the potential for nontarget injury to wildlife and pets. While California already has the strictest rodenticide laws and regulations in the country, there have been recent calls to ban all rodenticide applications in the state. Several Assembly Bills (AB 2596, AB 1687, and AB 2422) have been introduced proposing either bans or major restrictions on rodenticide applications.

Anticoagulant rodenticides have been detected in many species of wildlife worldwide; yet the origins, exposure pathways, and effects of these exposures are not well understood. The origins of these rodenticide exposures from point of application to point of acquisition are being studied by a collaborative group from the University of California Agriculture and Natural Resources and California State University, Fullerton.

Second generation anticoagulant rodenticides (SGAR) are important public health tools used for the quick and effective knockdown of rodent infestations in urban areas. Unfortunately, SGARs are regularly detected in many species of wildlife, perhaps because top-level carnivores and birds of prey are thought to prey on rodents that have been exposed to these rodenticides. However, while urban carnivores like coyotes (Figure 1) are often found (postmortem) to have been exposed to both first generation anticoagulant rodenticides and SGARs, they are not known to consume rats and mice in large quantities.

To determine what coyotes eat and potential sources of rodenticide exposure, the research group is investigating the stomach contents of urban coyotes in southern California. While the study is only one third complete, stomach content observations have



PXHERE.COM

Figure 1. Urban coyote on pathway.

already revealed that coyotes consume more cats than rats, and their preferred mammalian food source is, in fact, rabbit.

The study will continue until the contents of 300 urban coyote stomachs have been examined. The research group will also determine what mammalian species are in the stomach by doing molecular analyses. The group hopes that once they have a clear and accurate picture of the diet of this urban carnivore in southern CA, they will have a better idea about potential sources of rodenticide exposure.

Figure 2. Skunk examining bait station.



N QUINN, UCIPM

The research group is also investigating how animals interact with nontoxic bait stations in the backyards of Orange County urban residents. With the help of the UC Master Gardeners of Orange County, the research group will examine whether the animals access the bait or physically interact with a bait station in a way that may cause the bait to become dislodged as well as other potential exposure issues. The study is still in its infancy, however, and many animals ranging from mice to bobcats have been detected already (Figure 2). Despite the range of stations visitors, the only animals so far observed to enter bait stations to access the nontoxic bait were rats and mice.

Within urban pest management programs, it is crucial that we determine the potential routes of wildlife exposure to pesticides so that public health can be protected while limiting negative impacts on the environment.

—*Niamh Quinn, Human-Wildlife Interactions Advisor, San Diego, Orange, and Los Angeles counties, UC Statewide IPM Program, nmquinn@ucanr.edu*

Upcoming Meetings and Workshops

Weed Management Expo for School Sites

June 19, 2018

Long Beach Unified School District

June 22, 2018

Dixon Unified School District

apps.cdpr.ca.gov/schoolipm/outreach/main.cfm

West Coast Rodent Academy

November 7-9, 2018

Irvine, CA

ucanr.edu/sites/WCRA/



WEST COAST RODENT ACADEMY

PCOC Expo

June 20-22, 2018

South Lake Tahoe, Nevada

pcoc.org/events

Visit UCIPM at Booth #9 to complete our survey and win prizes!



New Resources

Fresh Off the Press—*Pests of the Garden and Small Farm, 3rd edition*

A new edition of the best-selling *Pests of the Garden and Small Farm: A Grower's Guide to Using Less Pesticide* is now available for garden enthusiasts and small farmers. Authored by Mary Louise Flint, the book includes over 120 new color photographs and 400 color illustrations. Individual sections on insects and mites, diseases, nematodes, and weeds have been expanded to include more than 30 new pests. Six new crops, including herbs, were added to the crop tables in the back of the book.

The focus is on organically acceptable alternatives to meet the needs of home gardeners and small scale farmers, using a scientifically based IPM approach. Techniques that make minimal use of broad-spectrum pesticides are highlighted. This handbook is a valuable resource for successful management of pests on vegetables, herbs, and fruit and nut trees.



New! Pocket-Sized Guide for Vegetable Pest Identification

The *Vegetable Pest Identification for Gardens and Small Farms* card set is a handy, quick reference that focuses on sustainable pest management for vegetables, melons, fruit trees, and other crops commonly grown in small-scale farms and backyard gardens. Compiled by Mary Louise Flint, Andrew Sutherland, and Karey Windbiel-Rojas, the cards cover common insect and mite pests as well as pathogens, nematodes, abiotic disorders, weeds, and vertebrate pests. You'll also find information on general predators, lady beetles, parasites, and insect pathogens to help you identify "good bugs" in the garden. Based on the bestselling *Pests of the Garden and Small Farm*, this set of 53 colorful, pocket-sized cards is a must have.

Order online from the UC ANR Catalog at anrcatalog.ucanr.edu.



WHAT IS IPM? Integrated Pest Management (IPM) programs focus on long-term prevention of pests or their damage through a combination of techniques including resistant plant varieties, biological control, physical or mechanical control, and modification of gardening and home maintenance practices to reduce conditions favorable for pests. Pesticides are part of IPM programs but are used only when needed. Products are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

Ask the Expert!

Q: Where can I get the hydrogel ant baits?

A: At this time, the hydrogel baiting approach is strictly experimental. There are currently no commercially available products, legal applications, or existing formulations utilizing this technology.

Q: Why does it matter if fipronil and other pesticides are found in urban waterways?

A: Pesticide residues can kill small insects or crustaceans that live in streams and rivers. Fish feed on these tiny animals and will leave an area that lack this food source or starve. Fish are also vulnerable to poisoning when exposed to some pesticides like fipronil or pyrethroids. Pesticides running off the site of application into streams can also contaminate our water supply. Municipal wastewater treatment plants do not detoxify pesticides before releasing water into rivers.

For more information about pesticide runoff from urban areas in California, read the [June 2010](#) and [July 2010](#) issues of the UC IPM *Green Bulletin* at ipm.ucanr.edu/greenbulletin.



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Revised Pest Notes



UC IPM recently released two revised titles in its *Pest Notes* publication series aimed at landscape professionals and home gardeners.

Dandelion was updated in January 2018 and includes management practices and updated pesticide options.

ipm.ucanr.edu/PMG/PESTNOTES/pn7469.html

Snails and Slugs, revised in April 2018, describes effective ways to manage these pests both with and without pesticides.

ipm.ucanr.edu/PMG/PESTNOTES/pn7427.html

Visit UC IPM's *Pest Notes* web page for these and many more titles.

ipm.ucanr.edu/PMG/PESTNOTES

Always read and carefully follow all precautions and safety instructions provided on the pesticide container label, as well as any other regulations regarding the use of pesticides. Not following label directions, even if they conflict with information provided herein, is a violation of state and federal law. No endorsements of named products are intended, nor is criticism implied of products not mentioned.

University of California Statewide Integrated Pest Management Program



2801 Second Street
Davis, CA 95618-7774
E-mail: ucipm@ucanr.edu
Online: ipm.ucanr.edu/greenbulletin
Editor: K. Windbiel-Rojas
Production: B. Messenger-Sikes

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