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In this issue:

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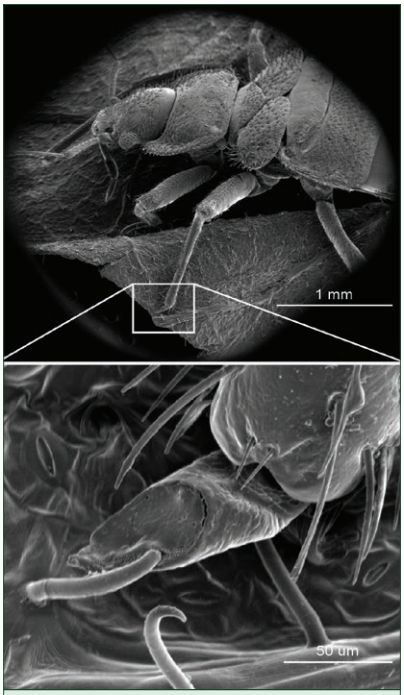
Bed Bug Traps Made From Bean Leaves

Bed bugs continue to pose challenges for pest management professionals (PMPs), and infestations are commonly detected in homes and other buildings. While there are a variety of different control methods available as part of integrated pest management (IPM) programs for bed bugs, PMPs have consistently identified bed bugs as one of the most difficult pests to control. This is likely due to their cryptic habits and their widespread evolution of resistance to commonly-used insecticides. Detection of bed bugs, especially when populations are low, can be very challenging. To address these IPM challenges, our applied research projects have focused on developing new monitoring and nonchemical control tactics for bed bugs.



C Loudon, UCI

Figure 1. Scanning electron micrographs of bed bug impaled by the material.
Top: Bed bug standing on material, its front half partly visible.
Bottom: A close-up view of the end of the left midleg, with part of its foot ripped off by the struggles of the bed bug with the material, and a trichome (plant hair) impaling the severed surface of the foot.

A new trapping material

Bed bugs have infested human homes for many thousands of years and therefore have been considered the first true “urban pests.” Centuries ago, people in eastern Europe commonly placed leaves from common bean plants around their beds and other resting places to help control crawling bed bugs. Bean leaves do not attract bed bugs, but when placed between bed bug harborages and their human hosts, they may trap bed bugs. The leaves ensnare bed bugs by impaling them on the sharp hook-like plant hairs (called trichomes) on the leaf surfaces; these actually puncture bed bug feet (tarsi) (Figure 1).

While this entrapment does not directly kill the bed bugs, they are often unable to free

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themselves, and so will eventually die from desiccation (losing water to the environment). Once dried, however, bean leaves lose this trapping ability, and fresh bean leaves may not be readily available or practical to apply in some environments. To solve this problem, our research team recently developed a chemical and physical leaf treatment that produces a long-lasting material with similar trapping qualities as that of fresh bean leaves. We think that this experimental leaf-based material may be utilized in the future within novel bed bug traps or barriers that could be useful as monitors or exclusion devices as part of an IPM program.

For now, the material, which is patent pending and not yet commercially available, can only be produced in small batches for evaluations in the laboratory and small-scale field environments. This experimental leaf-based material does not include any insecticides, nor does it require any harmful chemicals for its preparation process. Our research team's objectives include evaluation of the ability of this novel trapping material to catch wandering bed bugs and comparison to that of commercial devices commonly used for bed bug monitoring.

Evaluations of the trapping material

We have now completed evaluations of the experimental leaf-based material in the laboratory and in the field (a multi-unit housing environment). In the laboratory, we assessed its ability to trap bed bugs of different life stages when deployed in both vertical and horizontal orientations. In some of these studies, we also included fresh bean leaves as "benchmarks" (positive controls). We recorded the distance that each bed bug walked on the treatment materials before becoming entrapped, with shorter average distances corresponding to better trap performance. In these trials, we observed bed bugs of all life stages to become ensnared by both horizontal and vertical configurations of the experimental traps. In some cases, the experimental leaf-based material exhibited comparable trapping ability as that of fresh bean leaves (See References).

In addition to these simple evaluations and observations, we also compared the performance of the experimental leaf-based material to that of commonly-used commercial bed bug monitoring devices, including "pitfall traps" (sometimes called "interceptor devices") and adhesive "glue traps". These comparison trials involved releasing groups of bed bugs into the center of relatively large (20 inches X 20 inches) square arenas which contained trapping devices in each of the four corners; two commercial monitoring devices and two experimental leaf-based trapping devices, thereby providing direct head-to-head comparisons. We selected commercial monitoring devices with rectangular footprints so that they could be positioned in direct contact with the arena's corners, and we fashioned our experimental devices so that they were of the same or similar shape and dimensions as the commercial devices. For these trials, we recorded the location of each bed bug in the arena 24 hours after release: 1) on or in a commercial trap, 2) on an experimental trap, or 3) not on or in any

D-H Choe, UCR

Figure 2. Surface of the trapping material after one week under a bed in a bed bug-infested apartment as part of a field trial. The large number of bed bugs are visible in the photograph. The scale bar at the lower left is 2 cm.

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Bed Bug Trap Study

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trap. Overall, our experimental traps outperformed the commercial traps that we evaluated, catching significantly more bed bugs (see Table 1; pitfall traps and glue traps were considered together as "commercial traps", see References for more details and statistical analyses).

We have observed similar results in our small-scale field trials. For these real-world evaluations, we worked in collaboration with a pest control operator serving a multi-unit housing complex, placing bed bug traps in more than 50 apartment units within six different buildings. In each apartment, four different trapping devices were placed at each of the four corners of the bed or sleeping surface. Two of these devices were commercial traps (one glue trap and one pitfall trap), while the other two devices included our experimental trapping material (deployed in two different trap designs); all four devices were of the same surface area and general configuration, and specific corner placements were randomly assigned. After one week, we returned to the apartments and collected all the devices, recording the number and life stage of the bed bugs (and any other insects) trapped on or in each device (see Figure 2 for a photographic example of what we saw). Overall, the monitoring devices that included the experimental trapping material caught significantly more nymphs (immature bed bugs) than did the commercial traps within the same apartment (Wilcoxon signed rank tests revealed significant differences at the P = 0.05 level). These exciting results suggest that the experimental leaf-based trapping material shows particular promise for monitoring bed bug nymphs. All devices evaluated trapped statistically similar numbers of adult bed bugs (Table 2).

Table 1. Cumulative number of bed bugs observed on or in commercial traps (pitfall and glue traps considered together), on experimental leaf-based traps, or untrapped after 24 hours in large arenas in the laboratory. (see References for more details and statistical analyses)

On or in commercial traps	On experimental trapping material	On none of the traps
45	233	682

Table 2. Cumulative number of bed bugs caught during field trials in commercial traps (pitfall traps and glue traps considered together) or on experimental traps based on bean leaves (two trap designs considered together) after a one-week deployment in a multi-unit housing complex.

Stage	Commercial traps	Experimental trapping material
Adults	19	15
Immatures	90	360
Total of Both	109	375

Future directions

The results from both the laboratory and field trials have so far demonstrated the real-world trapping utility of our experimental leaf-based trapping material. Devices including this material have now been shown to be effective traps for bed bugs, and particularly for immature bed bugs, when used in both vertical and horizontal orientations. Our results strongly suggest that a material based on bean leaf surfaces could be incorporated into bed bug monitoring devices and barriers, potentially helping to detect infestations, exclude crawling bed bugs from sleeping or resting humans, and inform bed bug IPM programs. Research efforts considering these applications are continuing in the laboratory.

For more information about bed bugs and their management, visit ipm.ucanr.edu/home-and-landscape/bed-bugs/.

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Bed Bug Trap Study *continued from p. 3*

References

Liu et al., 2025. Using Leaf-Derived Materials to Stop Common Bed Bugs (*Cimex lectularius L.*) in Their Tracks. *Insects* 2025, 16(8), 786. doi 10.3390/insects16080786

Bustamante et al. 2025 A Novel Leaf-Derived Trapping Material Is More Effective at Capturing Common Bed Bugs (Hemiptera: Cimicidae) than Selected Commercial Monitoring Devices. Insects 2025, 16(4), 362. doi 10.3390/insects16040362

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Ask the Expert!

Q: What information does UC IPM have to help manage nuisance pests?

A: Nuisance pests-- such as bed bugs, flies, ants, and certain wildlife-- annoy people when they invade homes and gardens. They can sometimes cause damage or contaminate food and pest management professionals are often called in to deal with them.

D-H Choe, UCR

The odorous house ant forages for sweets in homes although it commonly nests outside.

Preventive measures such as sealing up cracks, crevices, and entry points and inspection of deliveries are recommended. Modern control strategies depend on the pest but can include sanitation to eliminate breeding and harborage sites, trapping to monitor the infestation and knock down the number of adults, and the use of insecticide baits. Heat treatment for bed bugs has been shown to be effective but in California, heat service providers must be licensed.

Some of these pests are considered nuisance, but some can also carry diseases and be of importance to public health. UC IPM provides detailed information about many common nuisance pests in the *Pest Notes* series. A few examples include:

Ants: ipm.ucanr.edu/home-and-landscape/ants/

Bed Bugs: ipm.ucanr.edu/home-and-landscape/bed-bugs/

Flies: ipm.ucanr.edu/home-and-landscape/flies/

Mosquitoes: ipm.ucanr.edu/home-and-landscape/mosquitoes/

Vertebrate pests: ipm.ucanr.edu/PMG/menu.house.html#VERT

Nuisance Flies in Buildings

Nuisance flies come in many shapes and sizes. Each type of fly has a slightly different habitat preference and breeding cycle. Flies are often bothersome during summer and fall. Several species of flies commonly enter homes and while most are merely nuisance pests, others can transmit diseases.

Fly life cycles

Fly life cycles are similar, but species vary in their breeding times and food preferences. In general, after breeding, female flies lay eggs which hatch into larvae (maggots) that feed on their preferred food sources. Once mature, the larvae migrate in search of a place to pupate (the resting stage where the larva is transformed into an adult insect). Adults emerge from the pupae to breed and feed. The entire life cycle is often completed in 7 to 14 days but depends on fly species and environmental conditions.

Some common nuisance flies

- Filth-breeding flies like **house flies** and **blow flies** develop in compost, animal waste, dead animals, and garbage. These flies are commonly contaminated with bacteria, including those associated with food poisoning and can spread disease when landing on food.
- **Fungus gnats** develop in soil as larva. They can be found indoors breeding in potting media used for houseplants or hovering near windows.
- **Fruit flies** lay their eggs in overripe, rotting fruit. Adult flies are commonly seen flying around ripe or overripe fruit.
- **Drain flies**, also called moth flies, live in sink and sewer drains in their larval stage. The female flies lay eggs on the slimy organic matter that builds up inside drains. Adults are often seen on the walls or other surfaces near drains.
- **Mosquitoes** are also flies that can be a nuisance, but more importantly, they can carry deadly diseases.

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Adobe Stock.

Adult house fly, *Musca domestica*.

Bugwood.org

Common fruit fly, *Drosophila melanogaster,* on cake.

S Ellis, Bugwood.org

Blow fly on raw meat.

Nuisance Flies *continued from p. 5*

Managing flies

Many indoor fly problems can be managed by keeping them out with screening and other exclusion techniques. Caulk, screen, or cover all openings into a home to prevent flies from entering. Focus on sanitation practices that remove fly breeding sites. Remove or cover garbage and clean up spilled animal feed, manure, and pet waste.

Tips for managing these specific flies:

- **Drain flies**: Remove the organic matter in drains with a hard bristle brush.
- **Fungus gnats**: These flies thrive in overly moist potting soil. Let the soil surface of potted plants dry out between waterings or water plants from the bottom using saucers.
- **Fruit flies**: Dispose of overripe fruit that is attracting fruit flies and wash the area with soapy water.
- **Mosquitoes**: Drain standing water, use screens on doors and windows, and wear protective clothing when outdoors or if you are being bit indoors.

Several types of traps for flies are also available and can supplement other control methods. Fly paper and electrocution light traps can kill flies but are effective only in areas where exclusion and sanitation efforts have already reduced the fly populations to low numbers. Single flies can be easily killed with a flyswatter.

Various food-based traps are also available. These traps often contain a protein or sugar-based bait, sometimes with the addition of a fly pheromone (sex attractant). As with other traps, they should be used along with sanitation and exclusion. These traps are effective for species that breed on dead animals and garbage, such as blow flies and house flies and should be placed near the highest concentration of flies.

Pesticides are also available for fly control but are usually only a temporary solution so should be used with prevention, sanitation, exclusion, and trapping.

For more details about the nuisance flies described here and more, see the home and landscape section of the UC IPM website at ipm.ucanr.edu/PMG/menu.homegarden.html.

J Berger, Bugwood.org

Adult drain fly, *Psychoda phalaenoides*.

M Bettone, SCSU

Adult *Culex tarsalis* mosquito.

Adobe Stock.

Ultraviolet insect traps can kill flies in structures but work best as part of an integrated pest management program.

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Upcoming Meetings and Workshops (CEU opportunities)

NorCal Landscape & Nursery Trade Show

February 5, 2026

San Mateo, CA

Come visit our UC IPM Urban & Community team at our booth at the 2026 NorCal Trade Show!

norcaltradeshow.org/

CAPMA Termite Academy

Feb 17-18, 2026

Irvine, CA

web.capma.org/events/Termite-Academy-2026-Irvine-58/details

West Coast Rodent Academy

Save the date: March 11-13, 2026

Irvine, CA

ucanr.edu/site/west-coast-rodent-academy

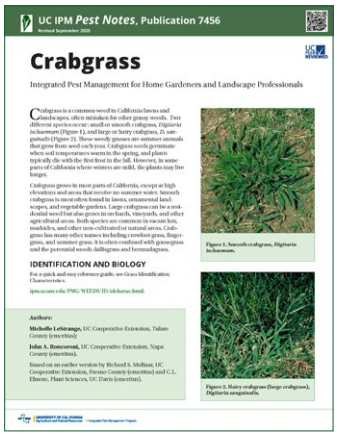
UCR Urban Pest Conference

Save the date: March 24, 2026

UC Riverside, Riverside, CA

urbanpest.ucr.edu/conference

Revised *Pest Notes*


UC IPM *Pest Notes*, Publication 7456

Crabgrass

Integrated Pest Management for Home Gardeners and Landscape Professionals

IDENTIFICATION AND BIOLOGY

Crabgrass

The newly revised *Pest Notes: Crabgrass* includes detailed descriptions and pictures to help you tell them apart. This publication, authored by UCCE emeritus advisors Michelle LeStrange and John Roncoroni, contains cultural and chemical control tactics to help manage crabgrass in urban settings and home gardens.

Online at ipm.ucanr.edu/home-and-landscape/crabgrass/

Visit UC IPM's Pest Notes web page ipm.ucanr.edu/PMG/PESTNOTES for these and many more titles

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.

For more information about managing pests, contact your University of California Cooperative Extension office, or visit the UC IPM website at ipm.ucanr.edu.