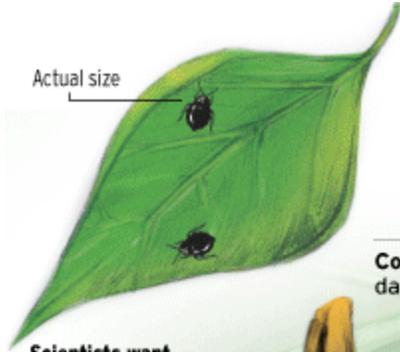


UCI uses kidney bean leaves to stop bedbugs' bite

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Scientists want to replicate the physical entrapment that occurs when bedbugs walk across bean leaves.

Trapping bedbugs

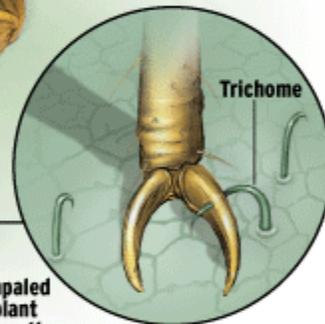
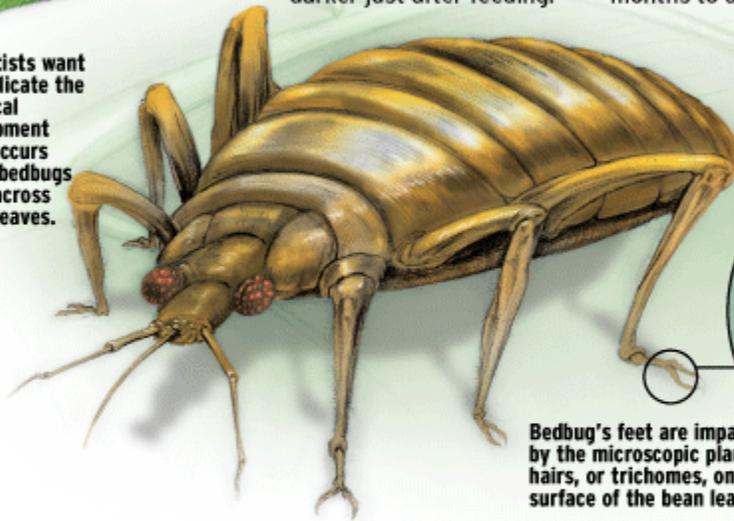
With the resurgence of bedbug infestations across the globe, scientists are attempting to recreate a successful, historic method of trapping and eliminating the pests.

ABOUT BEDBUGS

Color: Light reddish-brown, darker just after feeding.

Lifespan: 6 months to a year.

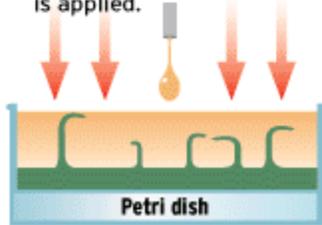
Feeding: Takes about 5-10 minutes to obtain full blood meal.



Bedbug's feet are impaled by the microscopic plant hairs, or trichomes, on the surface of the bean leaf.

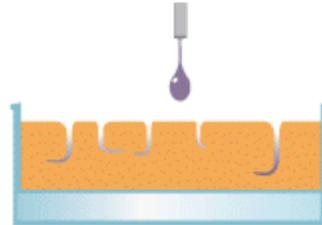
Replicating the bean leaf surface

① A negative mold is made from actual bean leaf and pressure is applied.

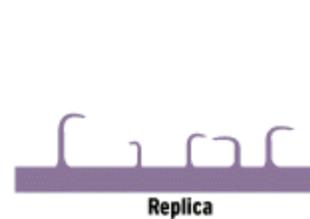


Source: UC Irvine

② Mold is filled with positive replica material.



③ Negative mold is removed, leaving replica.



Fred Matamoros / The Register

[By PAT BRENNAN](#) / ORANGE COUNTY REGISTER

An insect so famously annoying it has its own bedtime rhyme can be trapped and defeated by the humble kidney bean plant – specifically, kidney bean leaves, which impale the feet of bedbugs as they sally forth in search of a blood meal.

A scientific team that included researchers at UC Irvine, who spent more than a year making microscopic examinations of bedbug movements, confirmed the harpoon-like effects of hairs on the leaves.



This undated file photo provided by Orkin LLC shows bed bugs. UCI researchers have created an artificial version of kidney bean leaves' hooked surface, which will trap the bugs and which promises a new weapon against the night-biting pests.

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They were also able to create an artificial version of the hooked landscape on the leaves' surface, promising a new weapon against the night-biting pests.

"We spent a lot of time putting bedbugs on leaves, and seeing what happened," said UC Irvine researcher Catherine Loudon, co-author of a newly published study. "And sure enough, if you put bedbugs on bean leaves, they get punctured fairly quickly."

The kidney bean remedy for bedbugs has been known for a century or more in southeastern Europe, though it is not generally used today. The traditional remedy involved sprinkling the leaves on the floor around the bed.

The trapped bugs and leaves were gathered and burned the next morning.

In the 1940s, one scientist theorized that the microscopic hooks on the leaves' surfaces entangled the bedbugs, and perhaps even impaled them.

But it took scientists with modern, scanning-electron microscopes – and a great deal of patience – to confirm the leaves' action.

"They look like little microscopic candy canes, but with very sharp points," Loudon said. "Or maybe they're analogous to fish hooks."

Snaring a bedbug, it turns out, is no small feat. Bedbug legs and feet are covered with a tough cuticle.

Much like the joints in a suit of armor, however, there are weak spots, she said.

"Insect joints still have the cuticle there," she said. "It is just much, much thinner. There are just a few specific places on the bedbug foot that can get pierced."

Their painstaking measurements revealed that half of the bedbugs sent to walk across the leaves had their feet impaled after only nine steps – with each step defined as movement of all of the bedbug's six feet.

A clear picture of bug biomechanics in hand, the scientists proceeded to the next step: replicating the field of fishhooks.

That is when doctoral student Megan Szyndler of the UC Irvine chemistry department stepped in, combing through the scientific literature.

"She found in the literature this double molding method for replicating complex microscopic plant surfaces," Loudon said. "She tried it, and was able to get it to work beautifully."

But while the scientists were able to duplicate the features of the leaf surface, the artificial version does not do quite as good a job of trapping bedbugs as the original – at least, not yet.

"Nature is very, very hard to match," Loudon said. "We are not yet able to replicate the function of the leaves, which has been absolutely fascinating from a scientific point of view."

Loudon, who specializes in figuring out "the physical interactions of insects with their environment," is taking on the challenge.

She thinks the key is in the mechanics of the tiny hooks; the artificial versions might be too rigid.

"Our hypothesis is that perhaps we need slightly more flexible or bendable stalks," she said, which could allow them to skid along the surface of a bedbug's foot until they can snag a chink in its armor.

Loudon says she finds the microscopic details of the leaf-bug relationship fascinating – including their lack of any mutual evolutionary history.

"Part of the natural function of these hairs, in the real life of the bean plant, is some defense against herbivores," such as leafhoppers, she said. "It's just by an astonishing coincidence that it happens to be effective against bedbugs."

The goal is an artificial remedy against bedbugs that, one day, might be purchased at a store.

While bedbugs are not widespread in Orange County, they are found here, causing painful, itchy bites on their nighttime raids. They are not known to transmit disease.

"Bedbugs are causing a lot of misery, financially and emotionally and psychologically," she said. "It would be really terrific to come up with something."

The study was published online Tuesday in the Journal of the Royal Society Interface.

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