

Bean leaves can trap bed bugs: Next step is to perfect synthetic materials that can do the same

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Bed bug (*Cimex lectularius*). Credit: CDC/ Harvard University

Inspired by a traditional Balkan bedbug remedy, researchers have documented how microscopic hairs on kidney bean leaves effectively stab and trap the biting insects, according to findings published online today in the *Journal of the Royal Society Interface*. Scientists at UC

Irvine and the University of Kentucky are now developing materials that mimic the geometry of the leaves.

Bedbugs have made a dramatic comeback in the U.S. in recent years, infesting everything from homes and hotels to schools, [movie theaters](#) and hospitals. Although not known to transmit disease, their bites can cause burning, itching, swelling and psychological distress. It helps to catch infestations early, but the nocturnal parasites' ability to hide almost anywhere, breed rapidly and "hitchhike" from place to place makes detection difficult. They can survive as long as a year without a blood meal.

Current commercial [prevention methods](#), including freezing, extreme heating, vacuuming and pesticides, can be costly and unreliable. Many sufferers resort to ineffective, potentially dangerous measures, such as spraying nonapproved insecticides themselves rather than hiring a professional.

Doctoral student Megan Szyndler, entomologist Catherine Loudon and chemist Robert Corn of UC Irvine and [entomologists](#) Kenneth Haynes and Michael Potter of the University of Kentucky collaborated on the new study.

Their work was motivated by a centuries-old remedy for bedbugs formerly used in Bulgaria, Serbia and other southeast European countries. Kidney bean leaves were strewn on the floor next to beds and seemed to ensnare the blood-seeking parasites on their nightly forays. The bug-encrusted greenery was burned the next morning to exterminate the insects.

Through painstaking detective work, the scientists discovered that the creatures are trapped within seconds of stepping on a leaf, their legs impaled by microscopic hooked hairs known botanically as trichomes.

Using the bean leaves as templates, the researchers have microfabricated materials that closely resemble them geometrically. The synthetic surfaces snag the bedbugs temporarily but do not yet stop them as effectively as real leaves, Loudon said, suggesting that crucial mechanics of the trichomes still need to be determined.

Theoretically, bean leaves could be used for pest control, but they dry out and don't last very long. They also can't easily be applied to locations other than a floor. Synthetic materials could provide a nontoxic alternative.

"Plants exhibit extraordinary abilities to entrap insects," said Loudon, lead author of the paper. "Modern scientific techniques let us fabricate materials at a microscopic level, with the potential to 'not let the [bedbugs](#) bite' without pesticides."

"Nature is a hard act to follow, but the benefits could be enormous," Potter said. "Imagine if every bed bug inadvertently brought into a dwelling was captured before it had a chance to bite and multiply."

More information: Entrapment of bed bugs by leaf trichomes inspires microfabrication of biomimetic surfaces for pest control: [rsif.royalsocietypublishing.org1098/rsif.2013.0174](https://royalsocietypublishing.org/doi/10.1098/rsif.2013.0174)

Provided by University of California, Irvine

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