Plants fight back

Luis Wilfrido Atienza
November 18, 2017
lw.atienza@gmail.com

Cutworms (*Spodoptera litura*) are common garden and farm pests that feed on many different types of crop, including corn, potato, tomato, and rice. They typically feed on the leaves of seedlings and the tender stems of younger plants. They eat plant matter close to the ground and can eat through enough of the stem of a plant that they cut the plant down. In rice they mainly feed on leaves, although more mature cutworms can consume entire rice plants.

Cutworms prefer wet environments and so are commonly found in rice fields. Small-scale methods to combat these pests include simply picking the worms off at night, or constructing cardboard collars around plants, over which the cutworms cannot climb. However, across larger fields these solutions become impractical. And because of how common these insects are, and the massive damage that they are capable of, farmers must find ways to deal with them.

In larger farms a standard solution to a cutworm infestation is the use of insecticides. However, insecticides may have harmful effects on the environment and on other organisms. The popularity of organic foods has also created a demand for pest control solutions that make use of natural substances, reducing the need for synthetic insecticides.

Much research has been done on the essential oils of plants, which can be used as abundant, natural substances to combat different types of insect infestations. Essential oils can easily be extracted from plants, even common ones, and so even small farms can obtain them. And because they are natural plant extracts and are more likely to degrade over time, the risk of environmental contamination is reduced.

Many essential oils, from many different plant sources have emerged as effective ways to combat the presence of pests, and the high plant biodiversity of the Philippines means that many solutions can come out of local research as well.

A new development in this field comes from Abigaile Javier, Virginia Ocampo, Flor Ceballo, and Pio Javier, from the Philippine Nuclear Research Institute and the University of the Philippines Los Baños. This team of researchers published in the *Philippine Journal of Science* a paper looking into the potential uses of several local plants as insecticides against *S. litura*.

The plants chosen by the researchers were *Alpinia pyramidata*, *Lantana camara*, *Coleus amboinicus*, and *Curcuma longa*, all of which are common and easily obtained in the Philippines. The researchers wanted to test how extracts from these plants could combat the cutworm in different scenarios. Specifically, they examined the effects of the oils when applied directly onto the insects, as well as when the insects came into contact with plant leaves that had been treated with the extracts. They also wanted to see how well each essential oil repelled the cutworms and prevented them from feeding on the leaves at all.

When applied directly to the insects, extracts from *A. pyramidata* showed the most promising effects. Seventy-two hours after the researchers applied the extract to their insect specimens, 90% of them died, having been exposed to the highest dose. This is compared to the 97.50% mortality rate of their control substance chlorfluazuron, a common insecticide. The other plant extracts also performed fairly well, with mortality rates at around 80%. This means that these extracts could potentially be used to control an ongoing cutworm infestation.

Adult S. litura specimens which were exposed to the plant extracts in their larval form, compared to a normal adult (a).

The researchers also treated the leaves of *Brassica rapa*, or pechay, with the essential oils that were extracted from the plants, and had cutworms come into contact with these leaves. In this test, all the plant extracts proved to be very effective at killing the insects, except for the *A. pyramidata* extract, which killed only 75% of the insects. Compared to the previous test, this shows how these plant extracts can be used preemptively to make a field more resistant to infestation by treating leaves in advance.

While none of the plant extracts was particularly effective in keeping cutworms away from plants, a high concentration of extracts from *A. pyramidata* stopped almost all the cutworms from actually feeding on the leaves. The extracts from *A. pyramidata* performed only slightly worse than citronella oil, a standard insect repellant.

The researchers also noted the effects of these essential oils on the development and life span of the cutworm. While all extracts caused some level of damage to the development of cutworms, *L. camara* and *Cu. longa* in particular greatly reduced the life spans of adult cutworms.

Using this information, more research could be done to develop and refine these extracts to make them more effective. The researchers also mention different studies that have been done, testing some of these plant extracts on different insects, such as *Plutella xylostella*, the cabbage moth.

This shows that these plant extracts have not only potential on their own, as antifeedants and insecticides, but also the potential to be used in conjunction with one another, combining the strengths and weaknesses of different extracts to make a farm resistant against many different pests.

Much work can be done in the lab to try to develop these combinations. Moreover, there is also much potential for the farmers themselves to be able to do some of this work. Considering that the process used to extract oils from these plants was relatively simple, farmers should be able to obtain these extracts fairly easily. This means they would be able to develop their own treatment and response plans that fit their unique needs.

REFERENCE

Javier AMV, Ocampo VR, Ceballo FA, Javier PA. Insecticidal activity of selected essential oil extracts against common cutworm, *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae). Phil J Sci 2017; 146:247–56.

Luis Wilfrido Atienza graduated from the Ateneo de Manila University, with a BS in Biology, and a minor in poetry. He currently works as a copywriter for a sustainability agency, and spends some of his free time writing about science.