Chemicals that make plants defend themselves could replace pesticides

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Chemical triggers that make plants defend themselves against insects could replace pesticides, causing less damage to the environment. New research published in Bioorganic & Medicinal Chemistry Letters identifies five chemicals that trigger rice plants to fend off a common pest – the white-backed planthopper, *Sogatella furcifera*.

Pesticides are used around the world to control insects that destroy crops. However, in recent years their use has been criticized, because of the detrimental effect they can have on ecosystems, ravaging food chains and damaging the environment. One of the problems with many pesticides is that they kill indiscriminately.

For rice plants, this means pesticides kill the natural enemies of one of their biggest pests, the white-backed planthopper Sogatella furcifera. This pest attacks rice, leading to yellowing or "hopper burn," which causes the plants to wilt and can damage the grains. It also transmits a virus disease called, southern rice black-streaked dwarf virus, which stunts the plants' growth and stops them from "heading," which is when pollination occurs.

Left untreated, many of the insects' eggs would be eaten, but when pesticides are used these hatch, leading to even more insects on the plants. What's more, in some areas as many as a third of the planthoppers are resistant to pesticides.

"The extensive application of chemical insecticides not only causes

severe environmental and farm produce pollution but also damages the ecosystem," explained Dr. Jun Wu, one of the authors of the study and professor at Zhejiang University in China. "Therefore, developing safe and effective methods to control insect pests is highly desired; this is why we decided to investigate these chemicals."

Because of the problems of using pesticides, it's vital to find new solutions to help protect rice plants from infestation.

Plants have natural self-defense mechanisms that kick in when they are infested with pests like the planthopper. This defense mechanism can be switched on using chemicals that do not harm the environment and are not toxic to the insects or their natural enemies.

In the new study, researchers from Zhejiang University in China developed a new way of identifying these chemicals. Using a specially designed screening system, they determined to what extent different chemicals switched on the plants' defense mechanism. The team designed and synthesized 29 phenoxyalkanoic acid derivatives. Of these, they identified five that could be effective at triggering the rice plants to defend themselves.

The researchers used bioassays to show that these chemicals could trigger the plant defense mechanism and repel the white-backed planthopper. This suggests that these chemicals have the potential to be used in insect pest management.

"We demonstrate for the first time that some phenoxyalkanoic acid derivatives have the potential to become such plant protection agents against the rice white-backed planthopper," said Dr. Yonggen Lou, one of the authors of the study and professor at Zhejiang University in China. "This new approach to pest management could help protect the ecosystem while defending important crops against attack."

The next step for the research will be to explore how effective the chemicals are at boosting the plants' defenses and controlling planthoppers in the field.

More information: Xingrui He et al. Finding new elicitors that induce resistance in rice to the white-backed planthopper Sogatella furcifera, *Bioorganic & Medicinal Chemistry Letters* (2015). DOI: 10.1016/j.bmcl.2015.10.041

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