Bamboozling the bark beetles

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The forest is struggling to cope with the largest bark beetle plague in 70 years. While the trees are suffering due to the heat and the drought, the pests are proliferating rampantly in the warm weather: A pair of European spruce bark beetles, for example, can produce up to 30,000 offspring. Starting in 2004 and most recently in the joint project

"bioProtect" (2015-2020), Professor Michael Müller, holder of the Chair of Forest Protection at TU Dresden, and his team have developed a method to regulate the beetles in an environmentally-friendly way. The project partners included the Department of Forest Zoology and Forest Conservation of the Georg-August-University Göttingen and the Ostdeutsche Gesellschaft für Forstplanung mbH.

The method involves treating raw wood, i.e. harvested wood, with substances that were originally extracted from the bark beetles' pheromones. These messenger substances are not only used as a means of communication between the bark beetles themselves, they also attract predators, for example the ant beetle. In this case, these messenger substances are referred to as kairomones. If raw wood is treated with certain kairomones, it attracts, for example, ant beetles that eat bark beetles. The bark beetles themselves are not attracted to this. Professor Michael Müller discovered the principle back in 2004.

With bioProtect, the researchers have zealously developed the method further using so-called allochthonous kairomones from other locations. Put very simply: In deciduous forests, they used substances from coniferous forests, and in coniferous forests, they use substances from deciduous forests. This ecosystem exchange tricks the bark beetles. This is because the bark beetles that colonize deciduous trees do not recognize the pheromones of the conifer bark beetles—and vice versa. Many predators of the bark beetles, however, can identify the pheromones of several bark beetle species—both in deciduous and coniferous forests. Some of them do not care which species of beetle sends out these signals, as long as it's a tasty bark beetle.

The foreign messenger substances are therefore selective: The enemies of the bark beetles are attracted by these substances, but other bark beetles are not. In the best-case scenario, the foreign substance acts as a deterrent. As larvae, the ant beetles eat the early stages of the bark beetle

that burrow into the wood. These predatory beetles also patrol the bark, where they catch and eat approaching bark beetles. In this way, they can prevent or reduce the infestation.

The kairomones can be produced in the laboratory. Thanks to further developments in the bioProtect project, Müller is optimistic that this method will be marketable in three to four years. "The forest owners will no longer be buying insecticides in specialist shops, but natural substances that they can attach to stacks of raw wood," he says.

The substances do not have to be sprayed on, but can be applied in ampoules, for example. These can be removed again after use. "The bark beetle antagonists, such as the ant beetle, which are drawn in by the allochthonous kairomones, are native species. Even if the populations are influenced by the use of the messenger substances, they regulate themselves quickly and without harmful side effects," says Müller.

The allochthonous kairomones method ensures that the infestation does not get any worse: It protects harvested wood, reduces the breeding success of bark beetles in protected areas and keeps population densities low. Wood values are therefore preserved and living trees are supported in their defense. In order to curb mass reproduction, the trees have to regain their health. A healthy tree can defend itself against bark beetles.

Provided by Dresden University of Technology

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