

19. Mimicking bat-ultrasound as a sustainable alternative to pesticides for moth control in greenhouses.

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Although greenhouses are more technologically advanced and have greater crop yields than ever before, moths still cause a significant amount of damage to the crops. The primary method for fighting moth infestations are insecticides. This practice is under societal pressure and new sustainable moth control methods are needed. In nature, moths are hunted by bats and have developed dedicated escape strategies against their predator. This includes an auditory system tuned to ultrasound for detecting an approaching predator's echolocation calls and dedicated escape flight manoeuvres. In response, bats alter their calls and use their own specialized flight manoeuvres to counter the moth's last minute effort at survival. Here, we aim to develop a sustainable, bat-inspired moth control solution in a greenhouse environment. For this, we will use ultrasound speakers that produce bat-like sounds to deter and disrupt the natural behaviour of moth flying in a greenhouse. To quantify the efficacy of the system, we track and analyse: 1) the escape manoeuvres of individual moths in response to the ultrasound and 2) the resulting flight activity of the moth population in greenhouses with and without the bat-mimicking speaker system activated. When faced with our sound system, the moth flight activity is reduced by up to 85% compared to the control. Moths that still do fly are found to fly more erratic and perform more escape flight manoeuvres. This highlights the inherent predator avoidance behaviour of moths and enforces application of ultrasound as a sustainable alternative to the use of pesticides in greenhouses.