Gene Drive System to Control D. suzukii Flies

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Technology description

Prof. Omar Akbari and his lab at UCR have developed a gene drive system using a synthetic maternal effect dominant embryonic arrest element (Medea) to controlD. suzukii. The engineered Medea element is a maternal toxin coupled to a tightly linked embryonic “antidote”. FemaleD. suzukiitransformed with the Medea element and antidote deposit a toxin into all oocytes. Should the embryo inherit a Medea element, it may inhibit the toxin’s lethality by expressing miRNAs as an antidote that targets the toxin. Embryos without a Medea element are not able to counter the effects of the toxin and do not survive past the embryonic stage.

The lab has also tested the transgenicD. suzukiiMedea in eight geographically distinct populations and showed that the overall transmission rate of the Medea element in each population was 94.2%. This suggests thatD. suzukiiMedea should be able to drive robust population replacement and cause a population crash by spreading Medea through a population and making it infertile.

Background

Drosophia suzukiiis a pest of many small and soft-skinned fruits, including cherries, raspberries, strawberries, peaches, grapes and others. This pest pierces and deposits its eggs within soft-skinned fruits. Most of the damage caused byD. suzukiiis a result of its larvae feeding on the fruit. However the piercing of the fruit’s skin also provides access to secondary infections of pathogens such as fungi, yeasts and bacteria. These damages can result in severe crop losses, and the implications for exporting producers are also severe. Current methods of control include insecticides which may kill beneficial insects like pollinators and useful predators and such methods are not ideal.

Related Materials

Buchman, A. et al. Synthetically engineered Medea gene drive system in the worldwide crop pest, D. suzukii. bioRxiv, July 11, 2017

Application area

Use of the Medea gene drive system to controlD. suzukiipest populations from damaging crops without the use of pesticides.

Institution

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