Biotech Advance May Yield Genetically Sterile Screwworms

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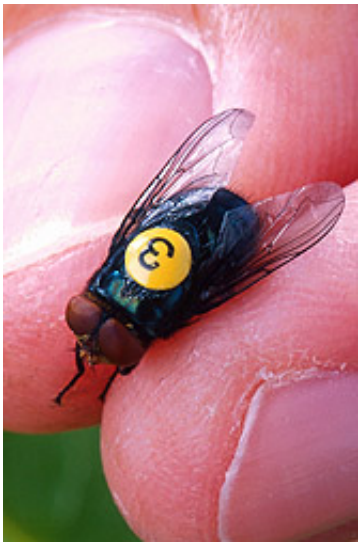

ARS entomologists are developing transgenic sterile, male-only screwworm flies that could eliminate the need for the expensive irradiation technique now used in screwworm control programs.

(PhysOrg.com) -- Transgenic screwworms developed by Agricultural Research Service (ARS) scientists could set the stage for new, improved methods of eradicating the pest based on the sterile insect technique (SIT).

Pioneered by ARS entomologists nearly 55 years ago, the SIT is a cornerstone of eradication programs implemented worldwide to control not only the screwworm, Cochliomyia hominivorax, but also the

Mediterranean fruit fly, tsetse fly and other insect pests. By one estimate, screwworm eradication efforts today save U.S. livestock producers at least $900 million annually in potential losses.

The SIT involves sterilizing adult male flies with irradiation and releasing them into the wild to mate with females. Their eggs' failure to hatch diminishes the size of the next generation. Fewer flies, in turn, mean fewer insecticide applications to protect livestock, especially those with open wounds, where screwworm larvae feed.

But irradiating screwworms is costly. Irradiated male flies are also less competitive than wild-type males. So, starting in 2004, the ARS team—entomologists Margaret Allen and Steven Skoda and geneticist Alfred Handler—began research aimed at developing genetically sterile, male-only screwworms using transformation technology first tried on Medflies, also targets of SIT-based eradication. Allen is at the ARS Biological Control of Pests Research Unit in Stoneville, Miss.; Skoda is a research leader with the ARS Livestock Insects Research Laboratory at Kerrville, Texas; and Handler works at the ARS Insect Behavior and Biocontrol Research Unit in Gainesville, Fla.

Using a genetic element called a "piggyBac transposon" as a vector, the researchers introduced a green fluorescent protein (GFP) gene into the genomes of eight screwworm strains. When viewed under ultraviolet light, the transgenic screwworms emitted a fluorescent glow, helping confirm GFP's activation. Caged mating experiments showed transgenic male flies were as competitive as wild-type males, the team reports in the journal Medical and Veterinary Entomology.

Once male-only screwworms are developed using the same transformation method as that used for the GFP strain, the next phase would explore inducing genetic sterility in the flies, which theoretically would eliminate the need for irradiation. Their field release, however,

would hinge on an environmental impact assessment and regulatory approval.

ARS is the principal intramural scientific research agency of the U.S. Department of Agriculture. The research supports USDA's Animal and Plant Health Inspection Service, which works with Mexico and Panama to keep screwworms out of Central America.

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