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An Overview
of Sterile Insect Technique

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Introduction

The most successful animal group in terms of evolution on earth is represented by insects. Nearly everywhere on earth, they have adapted to a variety of ecological situations. Most bug species contribute significantly and favourably to ecosystems. But some of them pose a serious risk to human and animal health as well as agricultural productivity. The primary method for controlling the numbers of insect pests and disease vectors has been the application of broad-spectrum insecticides for many years. Insecticide resistance has spread due to the persistent and unreasonable use of these chemicals, despite the fact that their detrimental effects on the environment, food chains and human health have all been shown. Sustainable, species-specific, and environmentally friendly methods are desperately needed. One such method is the sterile insect technique (Hendrichs, J., Vreysen, M. J. B., Enkerlin, W. R., & Cayol, J. P. 2021).

History

A.S. Serebrovsky, a Russian geneticist, first wrote about the use of sterile male in 1940 (Serebrovsky, A. S.1969). Edward F. Knipling invented the SIT, which was initially applied in the 1950s to limit the population of the New World screwworm, *Cochliomyia hominivorax* (Hendrichs, J., Vreysen, M. J. B., Enkerlin, W. R., & Cayol, J. P. 2021).

Methodology

A biological pest management technology called the sterile insect technique (SIT) releases large quantities of sterile insects into natural environments. In order to mate with the females, the infertile males compete with the fertile males. When a female mates with a sterile man, they have no progeny, which lowers the population of the following generation. Because sterile insects cannot reproduce themselves, they are unable to establish themselves in their surroundings (Mumford, J. D., 2021).. In sterile insect technology (SIT) and related biocontrol applications and postharvest quarantine procedures (Heather, N. W., & Hallman, G. J., 2008) (Bakri, A., Mehta, K., Lance, D. R., Dyck, V. A., Hendrichs, J., & Robinson, A. S., 2021), radiation can render the insect reproductively sterile by damaging chromosomes from the cells of the gonads.

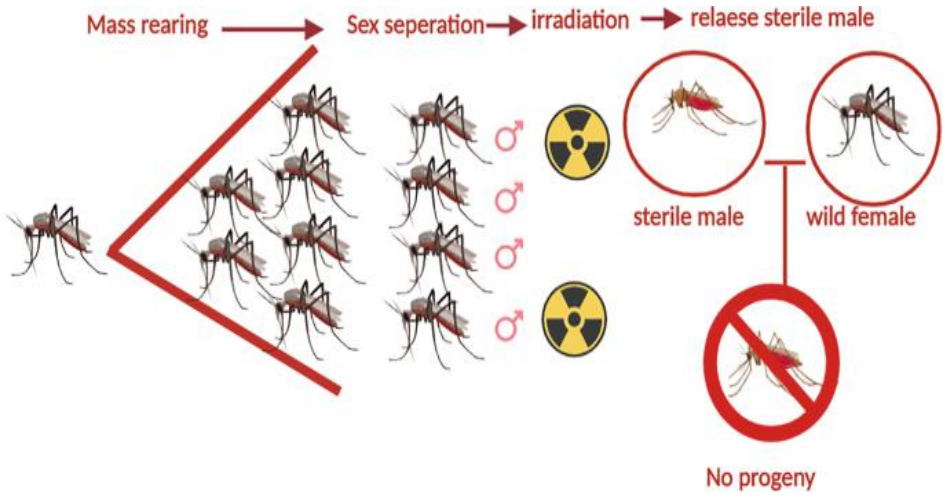

Fig. 1 Conventional SIT process

Application

Sterile Insect Technology (SIT) is a method of releasing large numbers of sterilized insects to reduce the mating of fertile wild partner. This technique was reported effective to eradicate the New World screwworm, the tsetse fly, melon fruit fly, Queensland fruit fly, pink bollworm, etc (Branagan, D., 2014).

Successful programs:

1. The screw-worm fly (*Cochliomyia hominivorax*) was eradicated from the United States, Mexico, Central America, Puerto Rico and Libya (Bakri, A., 2008).
2. The tsetse fly was eradicated from Zanzibar in 1998 (FAO, 2021) and Senegal in 2014 (FAO, 2014) (IAEA, 2015).
3. The codling moth (*Cydia pomonella*) is being effectively suppressed in parts of British Columbia, Canada (Anonymous, Web access).
4. The melon fly (*Bactrocera cucurbitae*, Coquillett) was eradicated from Okinawa (Anonymous, Web access).

Benefits of the technique

Integrated with other control methods, SIT has successfully controlled several advanced pests. In several countries where this technology has been implemented, retrospective economic evaluation studies have shown a very high return on investment. Advantages of using the technology include: a significant reduction in crop and livestock losses; protection of horticulture and animal husbandry by preventing the introduction of pests; create conditions for exporting goods to valuable markets without quarantine restrictions; job protection and creation; a significant reduction in production costs and human health costs; and environmental protection by reducing the use of pesticides (IAEA, 2015).

Conclusion

The sterile insect technique (SIT) is a successful and environmentally friendly method for controlling insect pests and disease vectors. By releasing large quantities of sterile insects into natural environments, the population of these pests can be reduced, leading to benefits such as decreased crop and livestock losses, protection of horticulture and animal husbandry, and reduced use of pesticides.

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