

Novel Green Technologies for Pest Control

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1. Mating Disruption Technology:

Known as insect family planning

Mating disruption is a term coined for the reduction in egg load or larval population through disruption of mating by inundating large quantities of pheromone in the field. The disruption is achieved through confusion (males are overtly confused), trail masking, and laying false trails.

Mating disruption aims to disrupt chemical communication by organisms and interrupt normal mating behaviour by dispensing synthetic sex pheromone, thereby affecting the organism's chance of reproduction. This can be done by using both attractive and non-attractive pheromone blends. Mating disruption with sex pheromones can be effective if the edge effect of mated females flying in from outside the treated area can be avoided.

- No Pest Resistance, No water Pollution, No Environmental pollution, pheromone based technology applied once a month for complete pest effective management.
- Family planning in insect pests by limiting the likelihood of mate finding in the field.
- The technology broadcasts specialized flowable formulations containing synthetic copies of the sex pheromones emitted by females to confuse the males and there by disrupting mating, which results in efficient season-long pest control.
- The presence of the sex pheromones in the environment delays or prevents mating of the insect, reducing fecundity and subsequent populations.
- It is an apply and forget, affordable, extremely safe effective pest management solution designed to provide alternative to chemical pesticides for Organic farming, increase farm income and safeguard grower and consumer health.

Successful mating disruption is indicated by a drop in the trap catches over time, reduced mating in fields as witnessed through visual observations, lesser incidence of pests or damage in comparison to untreated areas, and the absence of spermatophores in the females.

Sometimes avoidance or delayed mating with calling females was also attributed to effectively reducing the fecundity of the females.

Ecological factors such as emergence patterns of diapausing pupae, diurnal rhythms, and weather factors play a significant role in the effectiveness of mating disruption. Mating disruption has been the most successful approach for pest control over the past few decades. The release of large amounts of pheromone into a crop to prevent or delay mating has been remarkably efficient in a variety of cases, so that it is now an accepted control option for a number of lepidopteran pests of fruits, vegetables, and forests (Gut *et al.*, 2004). Important successes of mating disruption include control of the codling moth *Cydia pomonella* in pome fruit, the oriental fruit moth *Grapholitha molesta* in stone fruit peaches and nectarines, the tomato pinworm *Keiferia lycopersicella* in vegetables, the pink bollworm *Pectinophora gossypiella* in cotton, and the omnivorous leafroller *Platynotastultana* in vineyards (Il'ichev *et al.*, 2006; Welter *et al.*, 2005).

Recent examples of pheromone mediated mating disruption as promising strategy shown in Lepidopteran insects

| Scientific name | Common name | Family | Host plant |
|--|------------------------|----------------|------------|
| <i>Tuta absoluta</i> | Tomato leafminer | Gelechiidae | Tomato |
| <i>Trichoplusia</i> | Cabbage looper | Noctuidae | Cabbage |
| <i>Tecia (Scrobipalopsis) solanivora</i> | Guatemalan potato moth | Gelechiidae | Potato |
| <i>Spodoptera exigua</i> | Beet armyworm | Noctuidae | Cotton |
| <i>Phyllocnistis citrella</i> | Citrus leafminer | Gracillariidae | Citrus |
| <i>Pectinophora gossypiella</i> | Pink bollworm | Gelechiidae | Cotton |
| <i>Mamestra brassicae</i> | Cabbage moth | Noctuidae | Cabbage |

2. Attract & Kill:

Attract and kill is a hybrid form of integrated pest management that combines the power

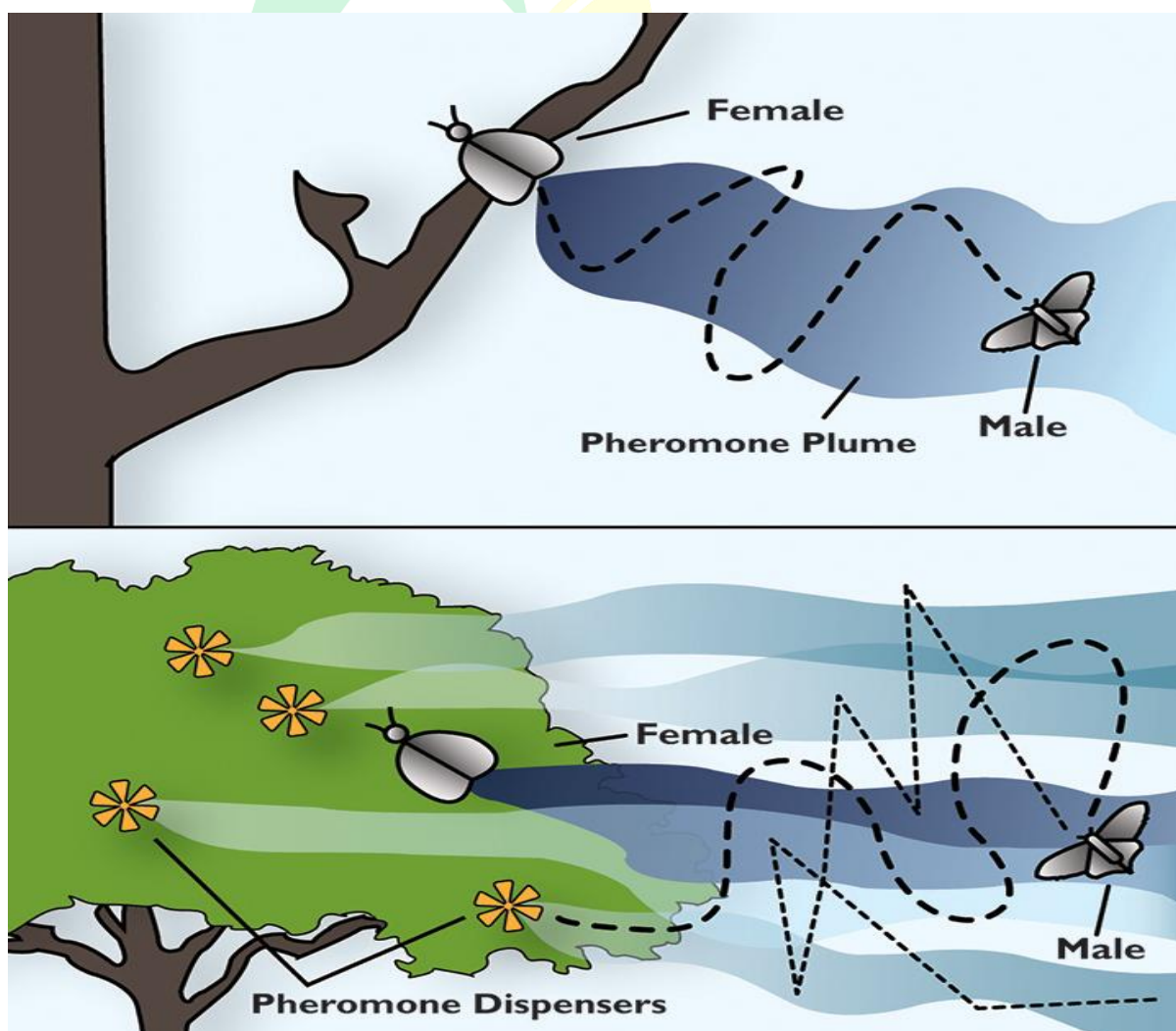
of semiochemicals attraction with the lethal effect of insecticides

- The attract-and-kill strategy is also referred to as “lure-and-kill” and “attracticide”.
- Broadly, attract-and-kill consists of attracting males, females, or both sexes of a pest
- species to an insect control agent (e.g., insecticide, sterilant, or insect pathogen).

- Upon contact, the insect is either killed (immediately or after a delay) or sublethal effects of the control agent diminish the pest population by reducing the insect's fertility or ability to mate.
- The insect attractant can be a chemical attractant, a visual cue, or a combination of these.
- Crude baits (e.g., food lures) are also used in attract-and-kill.

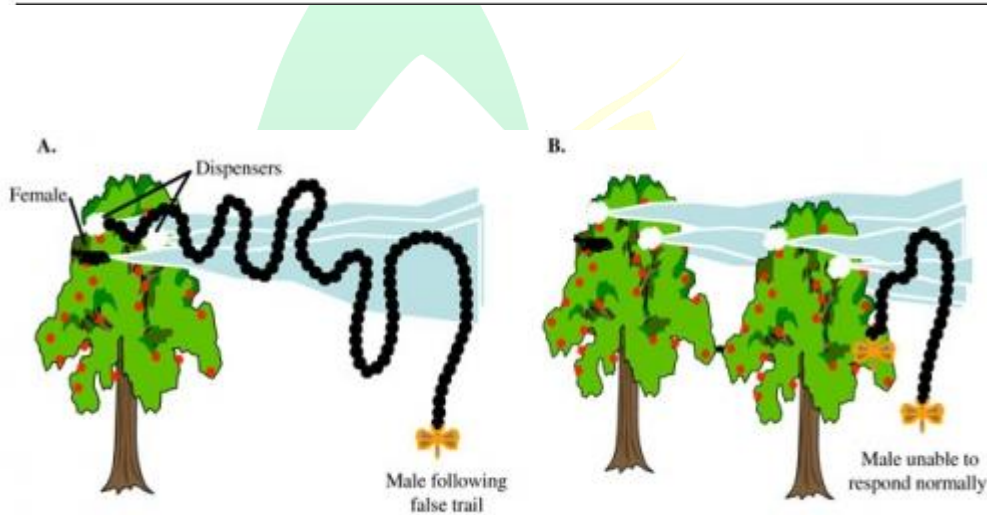
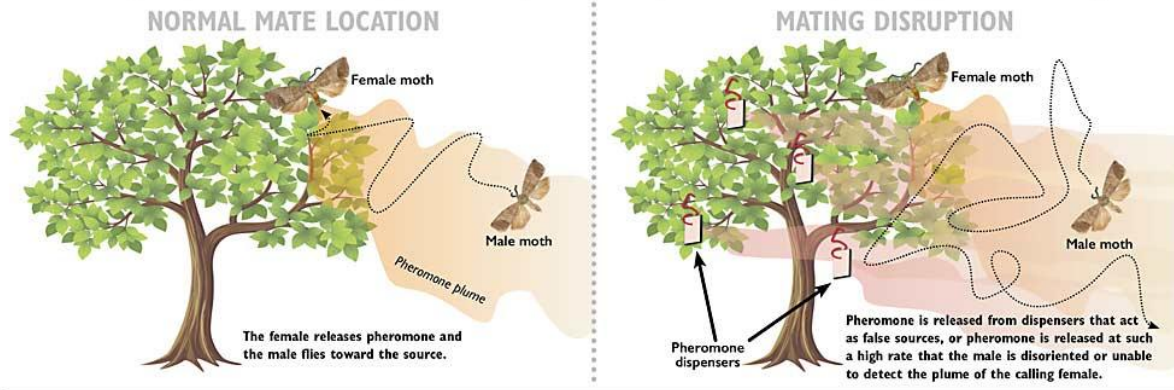
3. Repellents:

- Repellents drive away pests before they attack the crop.
- Repellents as compounds that deter or inhibit insects from finding, feeding on, or ovipositing on an attractive host substrate.
- Although a number of semiochemicals with repellent effects been identified, to date.



How mating disruption works

Mating disruption involves the use of synthesized sex pheromones to prevent male insects from finding females and mating.



The two principal means by which mating disruption is achieved: A) by competitive attraction where males are diverted from orienting to females due to competing attraction of nearby false trails emanating from pheromone dispensers, or B) by a non-competitive means where exposure to synthetic pheromone subsequently negates the male's ability to sense pheromone normally.





References

- Gut, L. J., Stelinski, L. L., Thomson, D. R., and Miller, J. R. (2004). Behaviour-modifying chemicals: Prospects and constraints in IPM. In “Integrated Pest Management: Potential Constraints and Challenges,” (O. Koul, G. S. Dhaliwal, and G. W. Cuperus, Eds.), pp. 73–121. CABI, New York
- Il’ichev, A. L. (2006). Area-wide application of pheromone mediated mating disruption in sustainable IPM. IOBC WPRS Bull. 29, 95–104.
- Welter, S. C., Pickel, C., Millar, J., Cave, F., Van Steenwyk, R. A., and Dunley, J. (2005). Pheromone mating disruption offers selective management options for key pests. Calif. Agric. 59, 16–22.