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Insect Traps: A Useful Tool In Integrated Pest Management

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SUMMARY

This abstract investigates the critical significance of insect traps in IPM. In addition to capturing and monitoring pest populations, insect traps contribute to species identification, threshold determination, and the development of targeted treatments, enhancing precision in pest management. As the global emphasis on sustainable agriculture develops, insect traps stand out as symbolic tools for balancing pest control with ecosystem health. This abstract explains how insect traps contribute to integrated pest management in a range of ways, emphasizing their importance in modern agricultural practices. Insect traps are an important part of integrated pest management (IPM) systems. Integrated Pest Management is a form of pest control that combines several pest control strategies to control pests in a sustainable and environmentally friendly manner. Insect traps play a crucial role in this approach by helping to monitor, detect, and manage pest populations effectively while minimizing the use of chemical pesticides. Monitoring and Detection: Insect traps are designed to attract and capture specific pest species. By strategically placing traps in the field or affected areas, farmers, gardeners, or pest management professionals can monitor pest populations and assess.

INTRODUCTION

The precise balance between pest, plant, predator and prey in the intricate tapestry of agricultural and ecological landscapes is a critical predictor of ecosystem health and productivity. As humanity efforts to meet the worldwide demand for food security and sustainable resource utilization, the age-old conflict against infestations of pests persists. Pest management tactics have evolved significantly in this endeavor, giving rise to Integrated Pest Management (IPM) as a fundamental approach. A broad tool at the center of this modern method not only provides real-time insights to researchers, farmers, and pest management experts, but also embodies a harmonic conjugation of science and sustainability. This tool is none other than the simple yet ingenious insect trap. Serving as both sentinel and strategist, insect traps have emerged as a cornerstone of integrated pest management, offering a wealth of benefits that extend beyond conventional pest control measures. This exploration delves into the pivotal role of insect traps within integrated pest management, unraveling their significance in monitoring, decision-making and fostering sustainable coexistence in the intricate realm of pests and crops. There are various types of insect traps designed to capture and monitor different types of insects based on their behaviors, preferences, and habitats. Each type of trap serves a specific purpose within integrated pest management strategies.

Types of Traps:

Here are some common types of insect traps.

1. **Light Trap :**

- Light traps attract and capture nocturnal flying insects by using artificial light sources. These traps are useful for monitoring and managing flying insects that are active at night, such as moths, beetles, and other flying insects.
- Bon fires are base for development of light traps followed by lanterns and kerosene lamps. Incandescent lamps, Mercury vapor lamps and Black light can be used as a source of light.

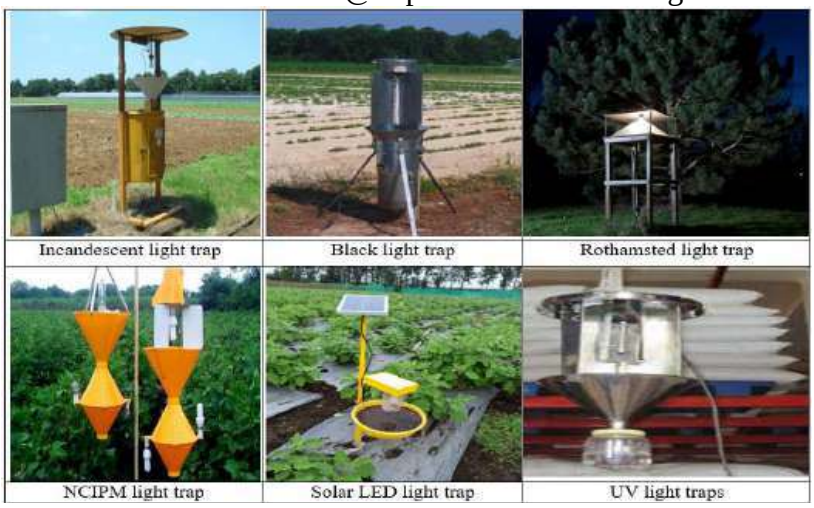
Types of light trap : 1) Simple incandescent light trap, 2) Low intensity incandescent light trap, 3) Robinson trap, 4) Rothamsted light trap, 5) Black light trap, 6) Electric grid type, 7) Solar LED light trap and 8) Light trap with automatic separation of insects.

- Target pests are nocturnal insects like Leaf hoppers, Plant hoppers, Bugs, Chaffers, Leaf folders, Stem Borers and Boll worms.
- Recommended to be installed at 2 to 3 feet height above the vegetation @ 5/ha.
- As they attracts beneficial and non-target organisms also it is suggested to operate the light traps only during peak period of pest incidence for *e.g.* Rice 8 pm to 12 midnight and Sorghum 8 pm to 11 pm.

Uses of light trap :

a. To record seasonal incidence for pest forecasting,
b. To study flight pattern and abundance in a locality,
c. Decision making on chemical control
d. Migration studies of flying insects.

UV light traps for store grain pests : Light is fitted at centre of funnel (250 nm) and plastic container is used as collection jar. Place at 1.5 to 5.0 m above ground level in corners. Target pests are: Lesser grain borer, Red flour beetle, saw toothed beetle and Psocids. Use @ 2 per 60 × 20 m sized godown.

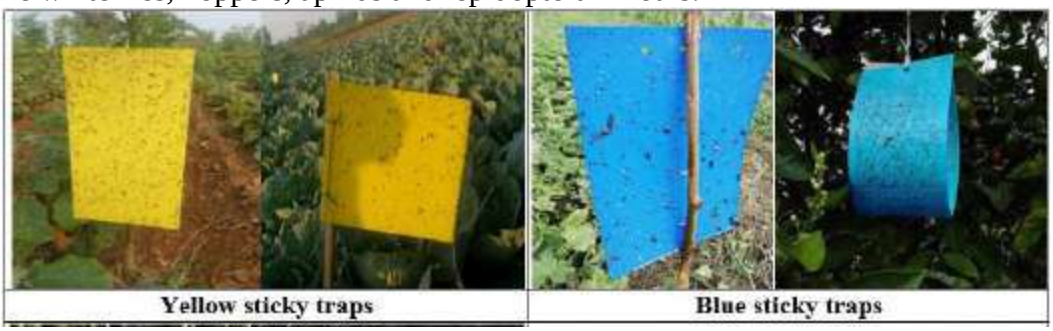


2. Sticky traps :

- Sticky traps are sheets or cards that have been covered in a sticky substance. They come in a wide range of colours, the most prevalent among them being yellow and blue.
- These traps are highly effective to attract aerial and small sized flying insects insects like as aphids, whiteflies, thrips, and leafhoppers. Insects are attracted to the colour, and when they encounter the sticky surface, they become immobilized.
- Castor oil/Vaseline/grease/gum Arabica can be used as sticky material. The combinations of stickiness + colour or Stickiness + Pheromone are works better for trapping more insects.
- Types based on colour are,

a. Yellow sticky trap : cotton whitefly and aphids
b. White sticky trap: Pigeon pea fly and weevils
c. Blue sticky trap: Thrips
d. Red sticky trap: Apple maggots.

- Erect the sticky traps against wind direction at different locations 30 cm above the crop canopy @ 5/acre.
- Replace the sticky materials once in two days.
- Target pests are whiteflies, hoppers, aphids and lepidopteran moths.



3. Pheromone traps :

- Pheromone traps attract and capture insects by using chemical compounds released by insects.
- These species-specific traps are used to monitor the presence and population levels of specific insect pests.
- Pheromone traps are frequently used for moths that cause damage to crops such as fruits and cereals.
- Synthetic substances of pheromones are available as lures in the form of rubber septa.

- Deployed at 1 m above crop canopy @ 5/ha for monitoring and 12-15/ha for mass trapping with a spacing of 40 m.

Types of Pheromones traps :

a. **Uni trap :** To capture large number of insects specially cutworms and army worms. It is a durable and cost effective trap structure.
b. **Funnel type trap :** Useful for managing Tobacco caterpillar (Spodo lure) and boll worms/tomato fruit borer (Heli lure).
c. **Delta type trap :** Cotton pink bollworm (Pectino lure) and spiny bollworm (Ervit lure).
d. **Bucket type trap :** Coconut rhinoceros beetle (Ferro lure) and Coconut Rhinoceros beetle (Rhino lure).

4. Pitfall trap :

- The pitfall trap, in its most fundamental design, stands as an ingeniously simple yet highly effective tool in the realm of entomology and ecological research.
- With variations that cater to diverse needs, its core principle remains consistent to capture and reveal the often-overlooked world of ground dwelling organisms.
- To trap insects active on soil surface i.e. ground dwelling insects *e.g.* Ground beetles and spiders.
- They are made with glass jar which contains kerosene and a funnel.
- **TNAU model pitfall trap for storage insect pests :** Designed for capturing insects on grain surface as a mass trapping and monitoring tool. It consists of plastic made top perforated lid and cone shaped bottom coated with sticky material on its inner side.
- **TNAU probe trap :** Consists of three major parts namely a main tube, insect trapping tube with 2 mm perforations and detachable cone. Air loving behavior of some storage insects is exploited in this device. Act as a good mass trapping tool @ 3 per 25 kg grain storage bin. Efficiency removes more than 80 percent of insects' *viz.* Lesser grain borer *Rhyzopertha dominica*, Rice weevil *Sitophilus oryzae* and Red flour beetle *Tribolium castaneum*.
- **TNAU two in one trap :** Three components structure with perforated tube, pit fall mechanism and collection tube. It is a combination of pit fall and probe trap which is suitable for pulse beetle.

Pitfall traps | TNAU traps for storage pest management

5. **Poison bait traps :**

- Food materials mixed with poison or insecticides to trap insects.
- Used mainly where dusting and spraying not possible.
- **Fish meal trap :** Perforated plastic container with cotton soaked DDVP to trap sorghum shoot flies.
- **Chemical with poison type trap :** Methyl Euginol:DDVP (1:1) for Mango/Guava fruit flies.
- **Cuelure :** DDVP (1:1) for cucurbits fruit flies. Molasses/toddy + 0.1 % Nuvan: to trap coconut rhinoceros beetle and fruit sucking moths.

6. **Water Traps :**

- Water traps, such as pitfall traps or emergence traps, are intended to capture insects that reside in or near water sources.
- Pitfall traps are containers buried into the earth, whereas emergence traps are designed to catch insects as they emerge from bodies of water such as ponds or streams.

7. **Funnel Traps :**

- Funnel traps have a funnel shaped entrance into a container.
- They are frequently employed to capture crawling insects.
- Insects enter the funnel but struggle to find their way out, eventually becoming stuck inside the container.

8. **Food-based Traps :**

- To attract insects, these traps use bait, such as food or plant material.
- When the insects are attracted, they become trapped within the trap.
- Food-based traps are used to capture pests such as flies, beetles, and ants.

9. **Visual Traps :**

- Visual traps attract insects by using visual signals such as colours or shapes.
- These traps are frequently used to catch pests that are drawn to specific colours or patterns.
- Fruit fly traps, for example, may use a visual lure to attract the insects.

10. **Barrier and Exclusion Traps :**

- Some traps function as barriers or exclusion devices.
- These are physical constructions that prevent insects from reaching the target plants.
- Such traps include row covers, sticky barriers, and insect proof netting.



11. Multi-Lure Traps :

- These traps combine various attractants, such as pheromones and food-based lures, to capture a broader range of insects.
- They are especially useful for capturing multiple pest species simultaneously.

12. Malaise Traps :

- Malaise traps are used to catch flying insects, particularly those which fly above the canopy.
- They are made up of a tent-like structure that funnels insects into a container.

13. Pan Traps :

- In the realm of entomological capture, simplicity becomes the harbinger of discovery with pan traps.
- Unpretentious and effective, these traps transcend their humble origins, becoming portals to the hidden world of micro Hymenoptera and a myriad of other insects.
- All it takes is a splash of color, a bowl, and soapy water a minimalist approach that yields profound insights.
- Different hues done the roles of attraction, each color a beacon for distinct insect communities. Yellow, blue, white, and red become more than shades; they become invitations to a dance of capture.
- Insect trapping plays a vital role in pest management by providing valuable information, facilitating decision-making, and contributing to the overall effectiveness of integrated pest management (IPM) strategies.

Role of Traps in Integrated Pest Management :

1. Monitoring and Detection :

- Insect traps act as sentinels, monitoring pest populations in agricultural fields, gardens and natural ecosystems.
- Traps provide real-time data on insect abundance and activity by capturing and quantifying the number of pests present.
- This information is crucial for early detection of pest outbreaks, allowing managers to intervene before pest populations reach damaging levels.

2. Data Collection and Analysis :

- Insect traps offer quantitative data that can be analyzed to determine the intensity of pest infestations.
- These data-driven insights aid in determining whether pest numbers are above or below predetermined action thresholds.
- Pest managers can discover trends and make informed decisions about the optimum timing and intensity of control activities by comparing trap catch data over time.

3. Species Identification :

- Different types of insect traps can be developed to attract specific pest species.
- This enables for accurate species identification, which assists pest managers in understanding which pests are present in a specific location.
- Knowing the individual pest species allows for the use of targeted control strategies that are most successful against those pests.

4. Threshold Determination :

- Pest management decisions are often based on established pest population thresholds the point at which action should be taken to prevent economic damage.
- Insect trapping data plays a key role in determining these thresholds, as the information gathered from traps helps determine the relationship between pest numbers and the level of damage caused.

5. Reduced Chemical Usage :

- Timely data from insect traps allow pest managers to implement control measures only when necessary.
- This reduces the unnecessary use of chemical pesticides, as interventions can be focused on times when pest populations exceed acceptable levels.
- By minimizing pesticide use, insect trapping promotes environmentally friendly and sustainable pest management practices.

6. Biological Control Enhancement :

- Insect traps can also be used to collect pest predators and parasitoids, allowing pest managers to analysis the effectiveness of biological control agents.
- This information assists in evaluating the role of natural enemies in pest population control and informing decisions on the release of beneficial organisms.

7. Integrated Approach :

- Insect trapping is an important part of integrated pest management, which emphasizes the employment of diverse pest control tactics.
- Trapping supplements other pest management approaches such as cultural practices, biological control, and chemical treatments, resulting in a holistic and sustainable approach to pest management. In summary, insect trapping provides pest managers with actionable information, allowing them to make informed decisions that preserve crops, ecosystems, and public health while minimizing negative environmental impacts.

CONCLUSION

The trap is a device that impedes or stops the process of an organism. The uses are; monitoring the population fluctuation, peak period of emergence, mass trapping, and killing of target pests. Based on the nature insect traps are classified into different types *viz.* Physical (Light and Sticky traps), Mechanical (Suction, Pitfall and Emergence traps) and Chemical (Pheromone and Bait traps).In the changing environment of integrated pest management (IPM), insect traps have emerged as important instruments, revolutionizing the way we approach pest control. These inconspicuous devices have evolved from basic mechanical contraptions to critical assets in the realms of sustainable agriculture and ecosystem management, thanks to their ability to capture, monitor, and inform. These traps act as early warning systems, identifying pest outbreaks and providing the information needed to make prompt, informed decisions. Their species-specific attractiveness exemplifies the precision of IPM, in which knowing the nature of the pest is critical to selecting the most effective control tactics. They expose the complexities of pest behavior and life cycles, leading to the creation of more sophisticated and long-term pest management approaches. Furthermore, insect traps embody the holistic attitude of IPM, supporting the integration of multiple tactics to achieve ecological balance and crop security. By accepting insect traps as crucial participants in integrated pest control, we embark on a journey that balances human needs with the vitality of the ecosystem. Insect traps inspire us to develop a future where pest management coincides with the enduring rhythms of nature by providing vigilant vigilance, insights, and pathways.

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