Role of Traps in Sampling of Stored Product Insects

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The objectives of insect trapping programs in stored product protection are to document presence or absence of a particular insect species, monitor changes in species composition, and estimate changes in insect density over time or space. Data from trapping programs are used to justify changes in pest management practices or to investigate the efficacy of a particular treatment. Trapping data should be used to complement ongoing pest management inspections, not to replace them. Trap use and interpretation of insect captures provide the foundation for integrated pest management programs and may be considered a method of sampling the insect population.

Types of Sampling:

1. Direct sampling
2. Indirect sampling

Direct sampling:

Direct sampling is defined as enumeration of insects present per defined unit of space or volume of a particular commodity. For example, counting the number of beetles in a grain sample.

Although direct sampling methods provide the most reliable estimates of insect density, it is unrealistic to use them with finished goods because products cannot be sold with adulterated packaging.

Direct sampling for insects that accumulate in cracks and crevices is not feasible, nor is it likely that a manager could identify every insect harborage.

Indirect sampling:

Indirect sampling is any method of capturing insects or estimating damage that is not directly tied to a unit of area, volume, or weight.

Trapping is considered indirect sampling because it is not known from how far away insects were drawn into the trap. Insect trapping programs can be operated in all types of commercial storage, processing, warehousing, and retail establishments without jeopardizing product appearance or customer confidence. Traps also can show the absence of insect activity, precluding the need for pesticide application or fumigation.

Types of Traps:

Commercial traps for capturing stored product insects in grain storage and food-processing facilities are widely available. New trap designs are continuously being introduced. Traps intended for stored product insects generally fit into five categories:

Light traps

- Light traps are wall-mounted, corner-mounted, or ceiling-suspended traps that utilize ultraviolet light (315 to 400 nm wavelength) as the insect attractant. The principle of operation is that flying insects are attracted to the light and are captured or killed when they enter the trap.
- Traps typically have a low current immobilizing electrical pulse or an electrocuting grid around the light source to kill insects and replaceable sticky cards to hold the insects.
- Located above the line of sight, they are commonly used for fly control in food preparation and pharmaceutical production facilities. Some models look like normal lights and can be mounted discretely in canteen, office, and reception areas where presence of flying insects is a sensitive issue.
- Light traps attract a wide variety of adult flying insects, including stored-product insects, but are limited in ability to detect and monitor key stored product insect species.
- For proper performance, light traps should be cleaned frequently, and light bulbs replaced every 6 to 12 months.

Aerial traps

- Aerial traps are intended to capture flying insects attracted by a pheromone lure or food that then become entangled in a sticky coating or are collected in an escape-proof chamber.
- Rather than being placed on a flat surface, traps are suspended in the air from poles, conduit, structures, or equipment.

- This category includes bucket traps, funnel traps, and any of the sticky traps made of laminated cardboard coated with a sticky material.
- Aerial traps are intended for capturing adults of economically important species.
- When properly baited with a pheromone lure, aerial traps are effective in capturing adult moths such as Indian meal moth, Mediterranean flour moth, raisin moth, tobacco moth, and almond moth, and beetles such as the warehouse beetle, cigarette beetle, and lesser grain borer.

Pitfall traps

- Surface traps are small, low profile traps intended to rest on horizontal surfaces to capture crawling insects such as stored-product beetles.
- Surface traps will capture adults of a wide variety of insect species and occasionally wandering immatures.
- Surface traps vary greatly in appearance but are typically constructed to take advantage of an insect's preference for seeking shelter and hiding in dark crevices.
- Traps that contain corrugated cardboard are particularly effective at attracting wandering moth larvae.
- Plastic pitfall traps are molded in the shape of a cone with a hollow center where attractants can be attached and insects can accumulate.
- These traps usually include a dust cover. Pitfall traps are unique because they are baited with both pheromone lures and food attractants. This combination is important because some insect species are more attracted to pheromone plus food odors than either component alone. Food odors may attract immatures such as warehouse beetle larvae. Although several species may be present in the trap, pheromone baiting tends to bias the capture frequency toward the insect for which the pheromone lure is intended.

Bulk grain traps

- Bulk grain traps are specialized pitfall traps for use in grain stored in facilities such as concrete silos, steel bins, and flat storages. These traps are constructed of a perforated cylinder with a collection vial attached on the bottom. The trap is inserted just below the top surface of a grain mass and left in place for several days.
- Insects wander into the traps and fall into the collection tip where they cannot escape.
- Pheromone lures are not recommended for use in probe traps, but research in this area is lacking.
- Bulk grain traps are placed near the surface because research shows that there are more insects in this portion of the grain mass.

Water trap

- As an alternative to pheromone lures as attractant for moths in food facilities, water by itself or water in conjunction with food and antifreeze have been proposed.
- An important advantage of using water as attractant is that it is equally attractive to male and female moths.
- Water as a moth attractant does not perform well in environments where water is available.
- It should only be considered a possible attractant for use in stored grain silos/ warehouses and or dry food processing facilities with high ambient temperature and low relative humidity.
- Water-baited traps for moths also may be considered as part of evaluating the performance of mating disruption programs.

Factors That Affect Trap Capture Rate:

1. Environmental conditions of the facility and general sanitation level around the trap will have a profound effect on the number of insects that can be trapped. For example, dust accumulation in both sticky traps and surface traps is a common problem in facilities that move or process grain.
2. Trap position will affect capture rate. Research shows that traps positioned under refugia, in corners, along walls, and near food sources capture more insects.
3. Indoor conditions such as air temperature, air movement, light, and photoperiod (light and dark cycles) affect insect captures in traps.

Limitations

- Pheromones are specific for specific pest.
- Lures should be replaced regularly.
- Traps should be clean without any dust or debris for effective monitoring.
- For proper performance, light traps should be cleaned frequently, and light bulbs replaced every 6 to 12 months.
- Water as a moth attractant does not perform well in environments where water is available.

Conclusion

The use of traps and subsequent interpretation of insect captures for monitoring and population estimation are the most efficient and cost effective tools available. Practical, economic, and ecological considerations require pest management professionals to conduct some level of experimentation each time a new trapping program is initiated. Data generated using traps and interpretation provides the best pest management decision support.

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