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Using Pitfall Traps to Monitor Insect Activity

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Pitfall traps are excellent tools for detecting first activity and monitoring the season-long activity of walking and crawling soil and litter arthropods, especially those that are active at night. Pitfall traps can be used in sampling programs for row crops, orchards, turf, pastures, woodlands, and landscapes.

What Is a Pitfall Trap?

A pitfall trap is a container that is sunk into the ground so that its rim is flush with the soil surface. Insects and other arthropods are captured when they fall into the trap. To prevent arthropods from escaping or preying on each other, pitfall traps usually contain a killing/preserving agent such as pet safe anti-freeze, soapy water, or ethyl alcohol (see More about Killing/Preserving Agents at the end of this publication).

Many pitfall trap designs are available. The circular and barrier pitfall traps described in this publication were selected for their low cost, ease of installation, and ease of servicing. A circular trap is a single pitfall trap, and a barrier trap consists of an aluminum-flashing barrier with a circular trap at each end.

Because of the channeling effect of barrier pitfall traps, they are much more efficient at capturing arthropods than circular traps. A barrier trap can capture up to six times as many arthropods as a single circular trap. Installation time is lower for circular traps, but servicing time for barrier traps is no more than for an equal number of circular traps. In most soils a circular trap takes less than five minutes to install, and a barrier trap takes 5 to 10 minutes. Hard soils increase the installation time because digging the hole takes longer. Either type of trap can be serviced in less than five minutes.

Circular Pitfall Trap

A circular pitfall trap consists of a permanent 32-ounce cup sunk into the ground and a removable 16- or 32-ounce collecting cup with the same rim diameter snugly nested into the permanent cup. Nesting the cups allows easy servicing and results in far less ground disturbance.

Figure 1. Removable collecting cup and permanent cup installed in ground.

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How to Install a Circular Pitfall Trap

Dig a hole as deep as the permanent cup is high. In softer soils, a golf-cup cutter and hand trowel work well to cut the holes. In harder soils, a posthole digger and digging bar might be needed.

Figure 2. Golf-cup cutter.

Figure 3. Cutter blade and plug just removed from turf.

Use cups with rim diameters that are the same or slightly less than the diameter of the golf-cup cutter, about 4.25 inches (110 mm). Poke drainage holes in the bottom of the permanent cup, then install it in the hole, packing soil around it. The rim of this cup should be just below the soil surface. Place a collection cup inside the permanent cup, and pack the soil so that its rim is flush with the soil surface and there are no gaps between the rim and the soil. Spread debris so that the area around the pitfall trap matches the surrounding soil surface. Pour 1 to 2 inches of killing agent into the collecting cup.

To prevent rain from filling the cup and to keep flying insects from being caught in the trap, install a cover made of an 8-inch (20-x-20-cm) plywood square supported by four 16-penny nails.

Barrier Pitfall Trap

A barrier trap consists of an aluminum-flashing barrier with a circular trap at each end. Use a piece of 1-inch (2.5-cm) wide by 3-foot (0.9-m) long angle iron to cut a 1-inch (2.5-cm) deep slice in the soil. Tap the angle iron into the soil with a hammer to make the slice. Slide a 3-foot (0.9 m) long length of 4-inch (10.3 cm) wide aluminum flashing into the slice. Bend over the sharp top corners of the flashing to minimize the risk of getting cut. Install a circular trap with plywood rain cover at each end of the barrier. To prevent arthropods from "sneaking through," be sure that each trap is in contact with the end of the barrier.

Servicing Pitfall Traps and Processing Samples

Pitfall traps should be serviced at least once a week.

To service a circular trap:

1. Remove the plywood cover.
2. Lift the collecting cup out of the permanent cup, disturbing the permanent cup as little as possible.
3. Pour contents of the collecting cup through a household strainer or fine wire mesh screen supported by a funnel into an empty collecting cup.
4. Empty contents of the screen into a specimen cup (4-ounce size works well) containing 70 percent ethyl alcohol. Swish the screen in alcohol to remove remaining contents, then rinse the empty collecting cup, screen, and funnel using a spray bottle of water.

Fig. 4. Barrier pitfall trap.

Fig. 5. Barrier pitfall trap with plywood rain cover (left) and funnel (right).

5. Secure the lid on the specimen cup for transport.
6. Place the collecting cup back into the permanent cup. Build up soil around the collecting cup so that no gaps exist between cup and soil, and replace debris if needed.
7. Add killing/preserving agent so there are 1 to 2 inches of fluid in the collecting cup.
8. Reinstall the plywood cover.

To service a barrier trap:

Both pitfall traps that comprise a barrier trap can be serviced at the same time by pouring the contents of one collecting cup into the other, then following the steps for servicing a circular trap. When reinstalling collecting cups, make sure both cups receive 1 to 2 inches of fluid.

Specimen Processing

Collected specimens can be stored in 70 percent ethyl alcohol or pinned for dry storage and identification.

Comments and Tips

1. In rainy conditions, mounding the soil so that the trap is just slightly higher than the surrounding soil surface will help reduce “flooding” of the cups.
2. If a collecting cup fills with rainwater, dump it out and replace with fresh killing/preserving agent.
3. Small animals sometimes get caught in traps. Remove toads, mice, worms, slugs, etc. before collecting arthropods. A funnel wedged into the top of the collecting cup will help prevent some small animals from falling into the trap.
4. Make sure lids on the specimen cups are secure so that alcohol does not spill out or evaporate.
5. Label specimen cups with field name, date, and trap number if necessary.

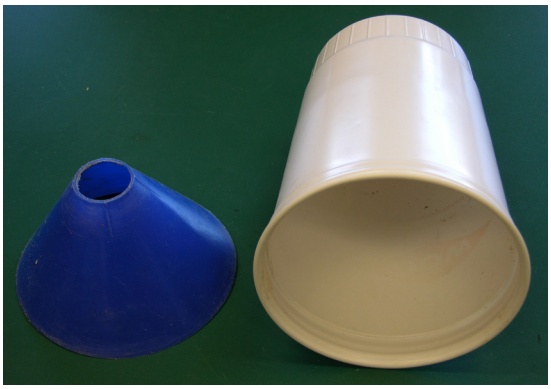

Fig. 6. Funnel with narrow end cut off and 32-ounce collecting cup.

How Many Traps per Site?

Install at least three traps per site, and more if you have time to sample them. Space traps at least 20 feet apart so that traps don't 'compete' with each other.

More about Killing/Preserving Agents

In cooler, moist conditions or if the traps are serviced often (more than once a week), salty water with a few drops of liquid soap can be used. However, when servicing traps that use soapy water, specimens should be rinsed in fresh water before being transferred to alcohol to prevent a film from forming on the specimens. Evaporation of this water-based solution may be a problem in hot weather.

In drier, hotter conditions or if traps are serviced less often than once a week, a solution that evaporates slowly should be used. Automotive antifreeze has a low rate of evaporation and will remain in pitfall traps for a long period of time. However, most brands of antifreeze should not be used because they contain about 95 percent ethylene glycol, which is deadly poisonous. This compound tastes sweet and is attractive to pets and other animals. When ingested even in very small quantities, ethylene glycol causes kidney failure and death. "Pet-safe" antifreezes contain propylene glycol, which is much less toxic than ethylene glycol. A 50/50 mix of pet-safe antifreeze and ethyl alcohol or water works well.