

FIELD COLLECTION METHODS

BEFORE YOU BEGIN

When collecting weed biocontrol agents, planning and timing of field collection is critical. For all species, it is usually most efficient to scout the potential collection site well in advance to ensure your desired species is present at suitable densities. The species of biocontrol agent and weather characteristics at your collection and release sites will determine the best time in the season to collect. Information specific to your agent of interest can be found in many of the useful publications on iBiocontrol.org. You can also contact your local or state weed biocontrol authority for timing suggestions specific to your area.

Prior to collection, ensure that all necessary collection supplies are on hand and that you can guarantee accurate identification of the biocontrol agent. Collect only on a day with good weather. Do not collect in the rain. Many biocontrol agents will hide and be difficult to find in rainy weather. In addition, excess moisture can cause adverse effects and biocontrol agents may drown in wet collection containers. The only exception to this rule of thumb is the collection of some biocontrol pathogens, for which overcast and rainy days are optimal for collection.

There are several methods for field collecting weed biocontrol agents. The best method depends on the species being collected, the abundance of the biocontrol agent at the collection site, the target weed, and the conditions at the collection site.

SWEEP NETS

Sweep nets are typically made of cotton or muslin on a metal hoop 10–15 inches (25–38 cm) in diameter attached to a handle 3 feet (90 cm) long (**Fig. 1**). You can buy them from entomological, forestry, and biological supply companies or you can make them yourself. As their name implies, they're heavy-duty nets used to "sweep" biocontrol agents off weeds. A sweep is made by swinging the net through the plant canopy. For hard-bodied insects like beetles, it's best to use no more than 100 sweeps before removing the insects from the net. Adult moths and flies are very fragile, so sweeping is not usually the best method for collecting. If you do sweep adult



Figure 1. Sweep net (Travis McMahon, MIA Consulting)

moths and flies, only make targeted sweeps (i.e., making a single sweep to capture an identified individual). Removing the sweep contents at regular intervals reduces the damage that can happen from knocking biocontrol agents around with rocks and twigs, and it reduces the opportunity for predatory insects and spiders from finding and devouring your biocontrol agents. To prevent sweeping soil and rocks into the net, sweep higher in the plant canopy. To prevent spreading other invasive plants to new sites, avoid sweeping in areas with dense grass or plants with barbed seed heads to ensure their seeds are not collected and moved to new sites.

ASPIRATORS

An aspirator (**Fig. 2**) is a device used to suck biocontrol agents from a surface (such as a net or beat sheet) into a collection vial, though it can also be used to remove some biocontrol agents directly from plants. A variety of aspirators can be purchased from entomological, forestry, and biological supply companies, or you can construct them yourself. Simple aspirators are powered by mouth suction, manually by using an aspirating bulb, or mechanically using a modified hand vacuum. Mouth-powered aspirators contain rubber tubing for inhaling (**Fig. 2a**) and a metal insect tube for collecting insects (**Fig. 2b**) into a storage vial (**Fig. 2c**). Inline filters (**Fig. 2d**) are commercially available to prevent unintentional inhalation or swallowing of particles or debris during mouth aspiration. At the very least, mouth aspirators should be equipped with fine-mesh screening on the vial end of the tubing held in the mouth (**Fig. 2e**) so that insects and small particles are not inhaled.

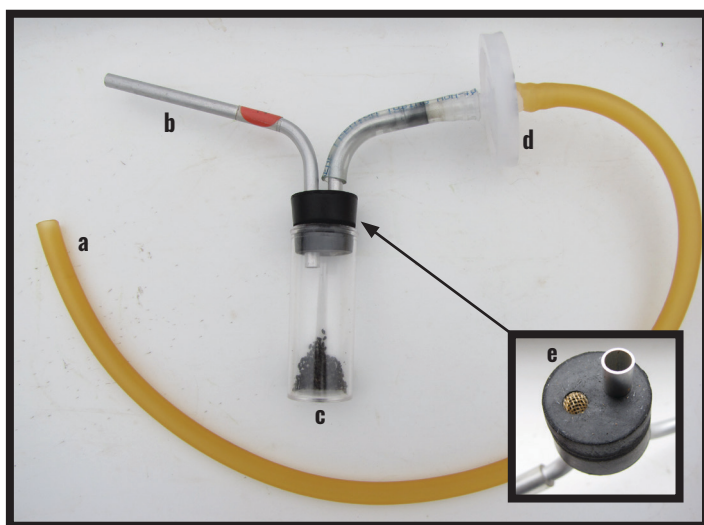


Figure 2. Aspirator components: (a) suction tube; (b) insect tube; (c) collection vial; (d) fine particle filter; (e) larger particle screen (Jennifer Andreas, Washington State University Extension)

HAND-PICKING/TAPPING

Stationary or slow-moving insects can be picked from foliage by hand using forceps. Other species can be tapped onto a tray, beat sheet, or net by using a tool such as a racket (Fig. 3a). Biocontrol agents thus tapped off the foliage can then



Figure 3. (a) racket and collection tray; (b) using an aspirator to collect biocontrol agents that were tapped onto a beat sheet using a racket (a,b: Eric Coombs, Oregon Department of Agriculture Bugwood.org CC BY-3.0 US)

be gathered directly using an aspirator (Fig. 3b) or sorted later using a sorting tray and aspirator. Avoid disturbing the plants before tapping because this will often cause biocontrol agents to jump or fly away.

VACUUMING

A leaf blower with reverse capability, an industrial strength wet-dry vacuum cleaner, or a specialized insect vacuum sampler (Fig. 4) can be equipped with a nylon mesh net on the inside mouth of the blowing tube to suck up adults of some species of biocontrol agents. This method is particularly useful for collecting small biocontrol agents such as flea beetles from weed rosettes. Rocks or debris vacuumed up may harm collected insects, so this method should be applied to foliage collections only. Adding rosette leaves to the net gives biocontrol agents surfaces to crawl and hide on and reduces the suction strength. Retrofitting the blower/vacuum with a larger diameter tube can also help prevent insects from being crushed during the suction process.



Figure 4. Motorized backpack vacuum sampler (Sharlene E. Sing, USDA FS RMRS)

LIGHT TRAPS

Light traps are used to collect nocturnal biocontrol agents (typically moths) that are otherwise difficult to collect during the day. Construct a wire or wooden framework to support a battery-operated lantern and beneath it a large funnel (with a wide enough opening for large insects) that rests inside a

wide-mouthed jar with target weed material in the bottom. Place it in a sheltered place near a target weed infestation. Start the light at dusk, and empty it in the morning. Alternatively, prop up a white sheet to serve as a reflecting surface (**Fig. 5b**), and place a lantern in front of it on a stool. Hand-collect the biocontrol agents attracted to the sheet as they land on the surface. Pay careful attention to sex ratios of the individuals collected because light trapping can result in a heavily skewed percentage of males or females, and this will impact whether or not the collection will be viable when making the biocontrol release. Also keep in mind that many similar-looking moths may be attracted with this method, so it is important all moths are properly identified as the target biocontrol agent before being transferred.

to prevent the introduction of new genetic material. Care should also be taken to avoid spreading other plant or insect species to new sites as this may inadvertently create future problems. Finally, transfers should only be made to sites within the same state because moving galled material across state lines is not permitted.

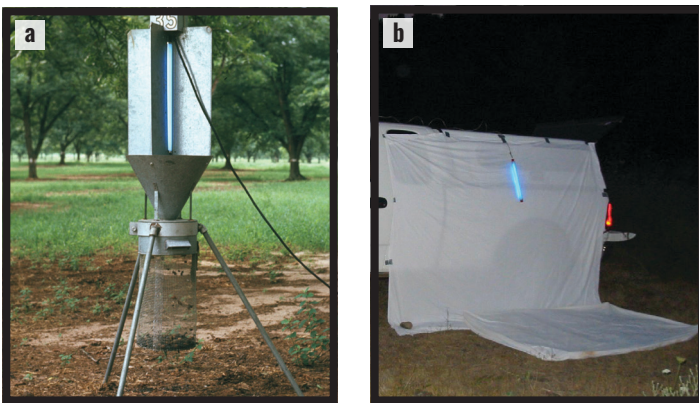


Figure 5. (a) light trap; (b) white collection sheet with a light (a: Jerry A. Payne, USDA ARS; b: Eric Coombs, Oregon Department of Agriculture, both Bugwood.org CC BY-3.0 US)

INFESTED MATERIAL

A common method for collecting stem and leaf-galling biocontrol agents, rust fungi, mites, and thrips is to transfer infested plant material to new sites. Infested stems can be cut, bundled in groups of 20–50 (**Fig. 6**), and moved to new sites where those biocontrol agents are not yet established. It is important to ensure weed seeds and roots are removed



Figure 6. Bundled stems containing biocontrol agents (Sharlene E. Sing, USDA FS RMRS)