

# K-STATE

Research and Extension

## Rove Beetle

### Biological Control Agent of Fungus Gnats and Western Flower Thrips

The rove beetle, *Dalotia* (formerly *Atheta*) *coriaria*, is a soil-dwelling predator used in greenhouse production systems to manage fungus gnat larval populations and the pupal stages (prepupae and pupae) of the western flower thrips. This publication provides information on the biology, feeding behavior, and rearing of the rove beetle.

#### Biology

The rove beetle life cycle consists of an egg, larva, pupa, and adult. The life cycle takes approximately 17 days to complete, although development time varies, depending on temperature. For example, the life cycle takes 21 to 22 days at 25 degrees Celsius (77 degrees Fahrenheit) and 11 to 12 days at 30 degrees Celsius (90 degrees Fahrenheit) to complete.

Rove beetle adults are 3 to 4 millimeters (approximately 1/8 of an inch) in length, glossy black, and covered with hairs (Figure 1). Adults actively search for food and can fly, but they tend to spend most of their time in growing media. The female-to-male ratio is 1:1. After mating, rove beetle adult females can lay up to 114 eggs during their approximate 50-day lifespan. Eggs are laid in the growing medium with larvae emerging (eclosing) from eggs in two to three days.

Young larvae that emerge (eclose) from eggs are white, turning light brown as they get older, with hairs covering



Figure 1. Adult rove beetle, *Dalotia coriaria* (Photo: Raymond Cloyd).

the body (Figure 2). There are three larval instars (stages between each molt). Pupae are covered by particles of growing medium held together by silken strands.

Adults emerge (eclose) from pupae and start searching for prey. Longevity of adult rove beetles may influence effectiveness as adults forage for a food source (prey) and females lay eggs for an extended time, which increases their ability to manage fungus gnat larval and western flower thrips pupal populations. However, cannibalism may occur when too many rove beetles are crowded into the same space.

#### Feeding Behavior

Rove beetle adults and larvae move around on the surface of growing media but tend to reside just below the growing medium surface. Adults and larvae feed on fungus gnat larvae and the pupal stages of the western flower thrips in the growing medium but also will feed on organic matter and mold.

Rove beetle adults feed on fungus gnat, *Bradysia* sp. nr. *coprophila*, larvae. Rove beetle larvae will not develop into pupae without a food source (prey). The consumption of fungus gnat larvae by rove beetle adults increases as the number of rove beetle adults increases up to four adult rove beetles per 10.1-centimeter (4-inch) container used to grow plants in greenhouse production systems. Watering practices and the type of growing media may influence the ability of rove beetle adults to effectively manage fungus gnat larval populations.



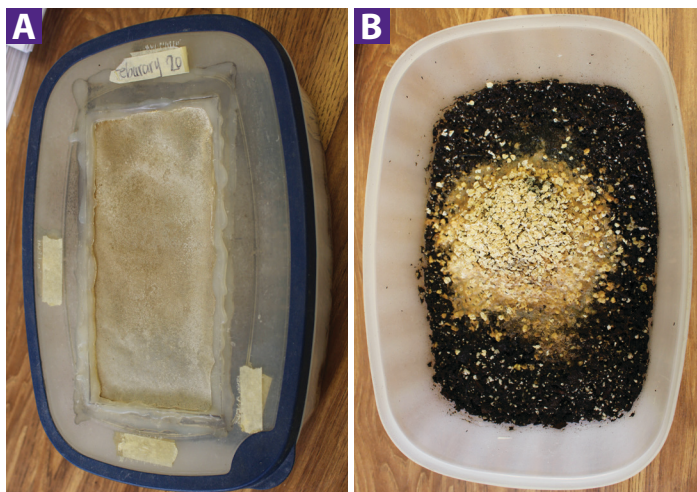
Figure 2. Rove beetle, *Dalotia coriaria*, larva (Photo: Raymond Cloyd).

The release of four rove beetle adults per 15.2-centimeter (6-inch) container is recommended for managing pupal populations of the western flower thrips, *Frankliniella occidentalis*. In addition, a predator-prey ratio of 1:15 is sufficient to manage populations of the pupal stages of the western flower thrips, resulting in fewer rove beetle adults that need to be released.

## Rearing

Rove beetles are commercially available from most biological control suppliers/distributors and are shipped as adults in containers. Rove beetle adults are easy to rear as colonies in plastic containers. The following are general procedures for rearing a colony of rove beetles:

1. Fill a 6.0 liter (1.6 gallon) plastic container with a growing medium containing 75% to 85% coarse sphagnum peat moss.
2. Growing medium should be moistened with approximately 1.6 liters (0.4 gallons) of tap water.
3. Heat the growing medium in a microwave for 20 minutes, and then let the growing medium cool.
4. Place 3.0 liters (0.8 gallons) of the growing medium into an 8.0 liter (2.1 gallon) container. Cut an opening [11.5 × 22.5 centimeters (4.5 × 8.8 inches)] in the lid and hot glue a section of insect exclusion screening [0.2 × 0.8 millimeters ( $\frac{1}{28}$  ×  $\frac{1}{32}$  of an inch)] to the lid for ventilation (Figure 3A).
5. Place about 200 grams (7.0 ounces) of moistened oats (*Avena sativa*) in the center of the container on the growing medium surface (Figure 3B).
6. Release rove beetle adults obtained from a biological control supplier/distributor into the container. Keep the growing medium and oats moist. Place the container in a dark room or cover with black plastic to exclude light, and check at least twice a week to ensure the growing medium is moist and rove beetle adults are moving around and feeding on the oats. Be sure the growing medium is moist at all times. Provide new oats once a week.
7. Collect rove beetle adults from the colony, using an aspirator (device for collecting material using suction), into a 33 milliliter (1.1 fluid ounce) plastic vial. The adult beetles can then be released into the greenhouse by placing the plastic vial onto the surface of the growing medium (Figure 4).



**Figure 3A.** Rove beetle rearing container with insect exclusion screening.  
**Figure 3B.** Oats placed in the center of the container provide a food source for rove beetle adults and larvae (Photos: Raymond Cloyd).



**Figure 4.** Plastic vial with rove beetle adults placed on the surface of the growing medium (Photo: Raymond Cloyd).

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