

NJDA Phillip Alampi Beneficial Insect Laboratory: Rearing *Rhinoncomimus latipes*

Eliza Kelemen
Cynthia Detweiler
Jennifer DeSio

Angela Lovero
Rhonda Strubel

Since 2004, the Phillip Alampi Beneficial Insect Laboratory has been working to develop a mass production method that would supply *Rhinoncomimus latipes* to Mile-A-Minute (MAM) (*Persicaria perfoliata*) weed control programs in Northeastern states. A laboratory rearing protocol was devised initially by Daniel Palmer, Amy Diercks, and Caryl Ott. This procedure was based on careful observation of both the host plant and the predator's biology and behavior, as very little published information on mass rearing the weevil was available.

In 2009, effort was focused on improving the previous year's rearing methods and adult storage techniques, as weevils were in high demand by many cooperators with invasive weed control programs in the Northeast. During 2010, a total of 133,308 weevils were produced, with 77,264 being released in MAM sites.

2010 *R. latipes* Rearing

1) Plant Production: Improvements in MAM plant production methods have been implemented, with hopes to produce healthier, fuller, more vigorous plants with sufficient growing tips for the developing weevil larvae to burrow into. PABIL staff has found that producing high quality plants plays a tremendous role in how successful the overall weevil production is. Thus considerable attention and effort is given to greenhouse plant production.

During the previous rearing season, laboratory staff experimented with a slow release fertilizer, Scott's Osmocote Plus (15-9-12), for the first time in the program's history. Throughout the experiment, the new slow release fertilizer was utilized with the standard fertilizer, Scott's Water Soluble (20-20-20). This study enabled a comparison of weevil yields for each treatment. Slow release fertilizer was added to the potting medium at transplanting in half of the plants, and the other half was administered the standard way, dissolved in the water and applied by hohon to the plant during normal watering.

The comparison study began in the winter months of early 2009. Initial observations suggested that the slow release fertilizer improved plant growth, so it was incorporated into the plant production procedure. The plants were showing increased vigor and the numbers of weevils produced per plant had increased 35%. (Figure 1)

However, as 2009 spring and summer data were collected, it was observed that our standard water soluble fertilizer, applied with the watering routine, was actually producing plants that yielded higher weevil returns, as seen in Figure 1.

Curiously, late 2009 fall data (Figure 1) again supported that the slow release fertilized plants yielded more weevils. A close look at the data provided some possible explanations.

Based on the daily recorded temperatures in the greenhouse (in red in Figure 1), it was theorized that high temperatures during the spring and summer months caused rapid breakdown of the slow release fertilizer, resulting in excessive nutrient intake and high plant mortality. The plants that did survive experienced a period in their later development in which they did not receive sufficient nutrients.

Based on these findings, the 2010 rearing season will include the addition of the slow release fertilizer. The question remains whether the fertilizer methods should be used together, or if there is a slow release fertilizer that is more appropriate for summer use. Utilizing the Osmocote slow release fertilizer appears to be more successful in the fall and winter months. Since the plants tend to dry out less and therefore require less watering, the standard fertilizer application may not provide sufficient nutrition. This may be when the use of the slow release fertilizer might be beneficial.

In addition to plant fertilization, another area that has been improved has been the standardization of pruning specifications. Work has been done to ensure that all personnel trained to work with the plants consistently follow the standard pruning protocol in order to arrive at similarly shaped plants. This will hopefully help lead to more uniform weevil yields in 2010.

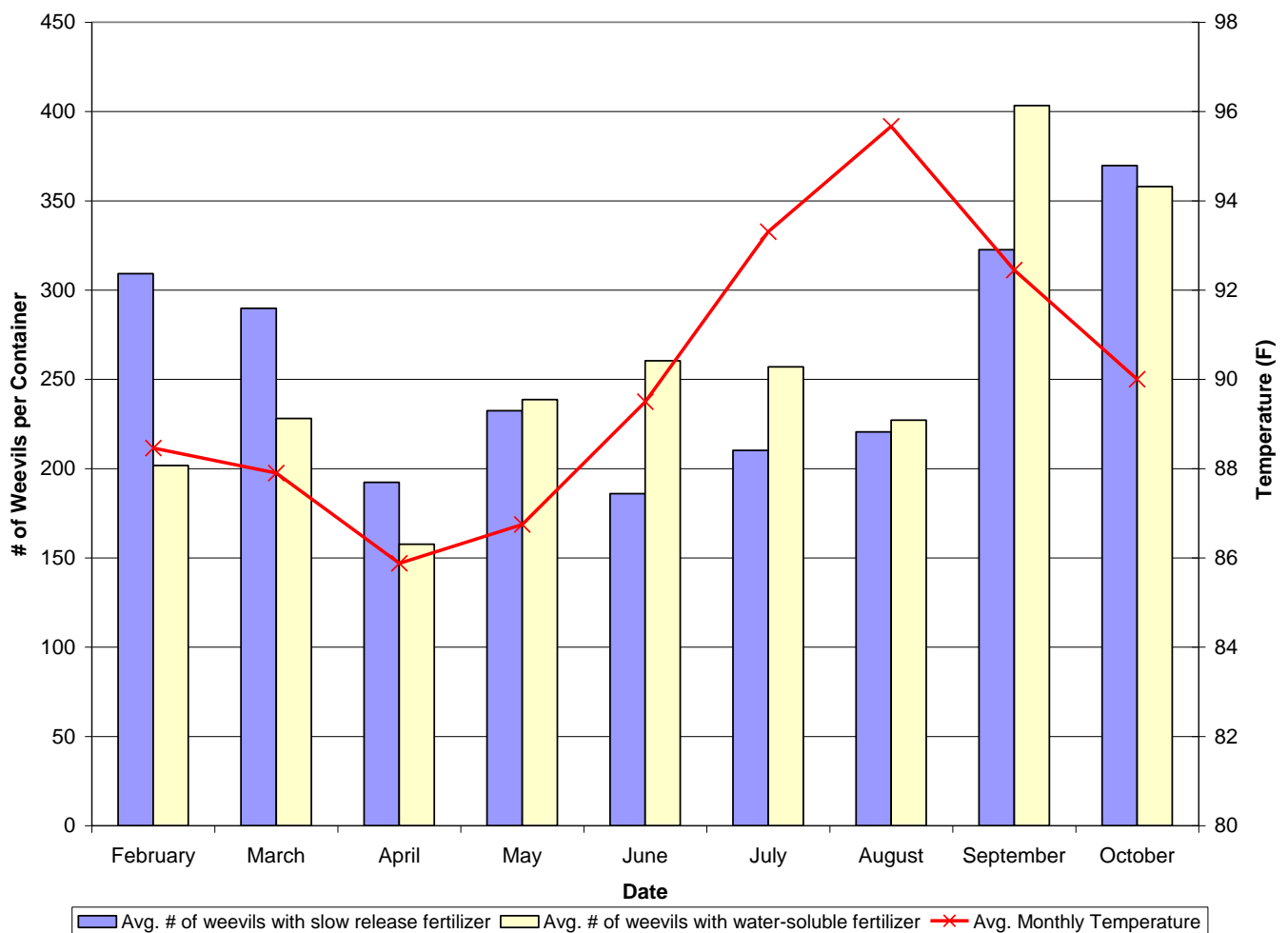


Figure 1: Slow Release vs. Water-Soluble Fertilizer in 2009 MAM plant production (Averages)

2) Adult Weevil Oviposition: In previous years, PABIL has collected weevil eggs from adult oviposition containers (7.5” x 6” x 16”) three times each week during peak season. During off-season months, when egg collection occurred twice each week, higher average numbers were yielded per plant (Table 1). Laboratory staff will continue egg collection twice weekly into the peak season of 2010 to determine if the average yield remains higher.

Adult weevils are replaced every three months with a younger generation to strengthen egg laying. Last year, 135 oviposition boxes were in use during peak season. The number of oviposition containers will be increased to 150 this year to maximize numbers for release.

Rearing Season	2007-2008	2008-2009	2009-2010
Avg # Weevils 2x Weekly	15.32	15.50	15.79
Avg # Weevils 3x Weekly	14.52	12.04	n/a

Table 1. Average number of emerging adults per plant

3) Larval Development: An experimental rearing method is currently underway. The goal is to increase the number of weevils produced, while decreasing the number of man hours spent on the project. Instead of introducing weevils to a plant for egg laying, and then transferring the plant to a development container, the weevils are initially placed into a 24” x 24” x 19” Plexiglas box with plants and allowed to mate, lay eggs, and emerge without excessive handling.

In 2010, the laboratory is working to further improve and refine this rearing method. Since, we assume that the weevils disperse and mate less in the larger Plexiglas box than in the smaller oviposition containers. To increase mating time, weevils will remain in their collection container for a longer period before releasing them into the larger oviposition boxes.

4) Adult Storage: Winter storage of *R. latipes* continues to be a challenge at PABIL. Various media and storage containers are being tested during the fall and winter months to decrease mortality. The goal is to maximize the survival of the weevils thus having greater numbers available for shipment in the early months of release season. Emerging weevils are collected and placed in 24” x 24” x 19” Plexiglas boxes in a 55°F cold room. Approximately 10 weeks later, they are collected and placed in a plastic dish (6” diameter, 2.5” deep) with 1 inch of medium (damp vermiculite and milled-moss mixture). The top of the dishes are vented to provide moisture control and air circulation.

After consulting with Dr. Rosemarie De Clerck-Floate, of Weed Biocontrol for the Department of Agriculture and Agri-Food for Canada, an idea from her own research suggested using a paper towel with plant material to store the weevils. The laboratory decided to expand on Dr. De Clerck-Floate’s recommendations by also using 7.5” x 6” x 16” containers containing whole plants: some with a vermiculite and milled-moss mixture, and some with only a paper towel. Next, dishes were set up with the following: 1) a vermiculite and milled-moss mixture with plant material 2) vermiculite and milled moss 3) paper towel

with plant material and 4) paper towel with excelsior. Also, additional dishes were set up with 5) vermiculite 6) milled-moss and sand 7) peat moss and sand 8) peat moss sand and un-milled sphagnum moss and 9) un-milled sphagnum moss. 50 weevils were placed in each dish and moved to a winter storage chamber at 37.4°F. This procedure was repeated once weekly for three consecutive weeks. Results will be available in one month.

Thus far, there have been problems with each set-up, including; excessive moisture, mold or conversely, drying out. The long-standing storage method of placing weevils in large Plexiglas containers (24" x 24" x 19") at 55°F for 3 months still proves to yield the highest survival rates. Optimally, a longer term storage method is desired.

Currently, PABIL is evaluating a plastic container (12.5" in diameter, 3" deep) with a screened top, which may help increase air circulation and resolve moisture issues. Results will be available in approximately three to four months.

Temperature shock may be another cause of weevil mortality in storage. Weevils have been stored for ten weeks at 55°F and were then moved to a deep storage chamber at 37.4°F, where they remained until spring. An intermediate storage area at 43°F is now being utilized two to three weeks prior to the final cold temperature exposure. This step-down process should determine if a gradual decrease in temperature will reduce weevil losses.

5) Adult Releases: For the 2010 release season, PABIL weevils will be available for shipment in the beginning of May, depending on spring weather conditions and MAM plant growth in release sites. The goal for this season is to surpass 2009's total releases in order to meet the increased demand for out-of-state requests.