

DEVELOPMENT OF AN ARTIFICIAL DIET FOR WINTER MOTH, *OPEROPHTERA BRUMATA*

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ABSTRACT

The winter moth, *Operophtera brumata*, is an invasive pest that was introduced to North America in the 1930s. First identified in Nova Scotia, this small geometrid native to Europe has spread to New England. It has caused extensive defoliation of deciduous trees and shrubs. In Massachusetts, a biocontrol project is underway to reduce populations by introducing a parasitic fly, *Cyzenis albicans*. Development of a successful artificial diet for the winter moth is critical in generating mass populations of the tachinid fly for biocontrol release. We tested various diets and diet ingredients to arrive at one that gave the best performance in terms of larval survival, pupal weight, and adult emergence. We can now rear large numbers of winter moths from egg to adult stages on this diet. We have also investigated various ways to shorten the winter moth generation time in order to produce a year-round culture.

Hatch of winter moth eggs: Eggs were initially collected by banding trees in November. Bands were brought into the lab in January, and all eggs were chilled in a 3.5° C holding chamber. Eggs were pulled from chill at 14-day intervals and placed in one of three temperature treatments for incubation, 18.3, 19.4, and 25.5 °C. Eggs were monitored daily to determine percent hatch in comparison to their incubation date.

Culturing: Once an optimal incubation time was determined, cohorts of eggs were pulled from chill and neonate larvae were infested onto four different diets. Larvae were maintained in environmental

chambers controlled at 21C +/- 3C with a 16:8 hour L: D photoperiod. All diets A-D were prepared in a commercial blender. Diet A., the gypsy moth diet, is composed of 66 percent wheat germ. Diet B., the pinto bean diet, is composed of 28 percent wheat germ and 26 percent ground pinto beans. Diet C, the modified gypsy moth diet, is composed of 63 percent wheat germ and 8 percent soy flour. Diet D., the general Lepidoptera diet, is composed of 50 percent soy flour (Bio-Serve).

Highest percent hatch results at various temperatures indicated that eggs need a 70- to 95-day chill period for best hatch. The eggs incubated at approximately 19 °C had the greatest percent hatch.

Larvae infested on diets B and C experienced the highest percentage of mortality. Diet B was significantly drier than the other diets, and all larvae died within 14 days. Diet D also caused high larval mortality, and no insects were reared longer than 14 days. Diets B and D were eliminated after 21 days. Larvae reared on diets A and C were the most successful. On diet A, 39 percent of larvae infested onto the diet reached the pupal stage and 46 percent of larvae from diet C reached the pupal stage. Diet C is a modified version of the B4 gypsy moth diet. Female pupal weights from diet C were comparable to wild-collected pupae that fed on host plants. Diet C females also laid the most eggs after mating, much more than the wild-collected adults. Adult emergence was also greater from the larvae reared on diet C.