

PUPAL ABNORMALITIES AMONG LABORATORY-REARED GYPSY MOTHS

Richard W. Hansen
USDA-APHIS, Otis Methods Development Center, Otis ANGB, MA 02542

ABSTRACT

Gypsy moth cohorts from 10 near-wild strains (one to six previous generations in culture), six wild strains (field-collected egg masses), and the standard "New Jersey" lab strain (34th and 35th generation in culture) were reared on Otis wheat germ-based artificial diet, in a constant environment. Rearings were begun with newly-hatched first instars; pupae were later collected daily, sexed, and weighed. Pupal lengths and maximum body widths were measured for some lab strain females. Collected pupae were classified as morphologically "normal" or as possessing at least one of seven types of morphological abnormalities, then reared individually to adult eclosion.

Less than 25% of near-wild, wild, and lab strain female pupae were classified as normal. "Banding" was the most common female abnormality; banded pupae possessed a light-colored, poorly-sclerotized cuticular band located ventrally between thorax and abdomen. Pupal abnormalities were infrequent among male pupae of all strains; most (>85%) were classified as normal. For both sexes, frequencies of occurrence for various pupal abnormalities varied little among strains.

Banded female pupae were significantly heavier, longer, and wider than normal female pupae. Normal pupae tended to experience longer larval stages, though mean larval development times for banded and normal pupae were not significantly different.

Pupal deformity patterns for lab-reared females were compared to those for feral and lab-strain females reared on oak foliage or artificial diet in an outdoor insectary. Most foliage-reared female pupae were normal; less than 5% exhibited banding compared to 70% or more of the lab-reared females. Diet-fed female pupae reared outdoors exhibited intermediate banding levels. Foliage-reared pupae were smaller, averaging ca. 1.22 g in weight, while lab-reared female pupae exhibited mean weights greater than 2.25 g. Thus, the occurrence of banding among female pupae appears associated with the larger sizes and, perhaps, more rapid development connected with artificial diet and laboratory rearing conditions. However, a direct abnormality-inducing role for the artificial diet or its constituents remains a possibility.

Banded female pupae successfully eclosed adults as frequently as normal pupae; only females with "gross abnormalities" yielded adult less successfully. Male pupae exhibiting morphological abnormalities produced adults less often than normal pupae. However, these reduced male eclosion rates are likely to have a minor impact, if any, because of the infrequent occurrence of malformed males.

Ongoing and future experiments will further quantify the impacts of pupal deformities on adult eclosion and egg mass production rates in the mass-rearing operation, and will address specific mechanism(s) responsible for the occurrence of pupal abnormalities.