SHORT COMMUNICATIONS

A Simple Method for Rearing the Onion Maggot, *Hylemya antiqua* MEIGEN (Diptera : Anthomyiidae) in the Laboratory¹

Several papers on rearing onion maggots, *Hylemya antiqua* MEIGEN have been published by RAWLINS (1953), PERRON et al. (1953), WORKMAN (1958), TOWGOOD and BROWN (1962), and NIEMCZYK (1964). The writers have reared this insect in the laboratory for experiments on chemotactic responses in adults and larvae which were carried out in 1963 and 1964 (MATSUMOTO and THORSTEINSON, unpublished). The method developed has several advantages over other published procedures.

The adult culture was maintained in the laboratory illuminated 16 hrs per day by fluorescent lamps and kept at 25-30°C (usually 25-27°C). One screen cage (54 cm on each side) with a cloth sleeve was used to maintain the flies for obtaining matured females and another smaller cage (45×23×23 cm) was used as an oviposition cage.

A mixture of evaporated milk, sugar, and water (1 : 0.3 : 4 : : vol : wt : wt) was added to the cotton pad in petri dishes placed on the floor of the large stock cage and changed three times a week at least. Brewer's yeast was sprinkled on folded paper towels inserted into three Erlenmeyer flasks (125 cc) filled with water and changed every third or fourth day before the paper dried.

The eggs were obtained as follows: slightly moistened coarse sand (particles 2-5mm diam.) was put in three or four glass containers (9×5 cm) 1-2 cm deep and in each, one-third or one-quarter of an onion bulb (diam. 5-7cm) was placed cut surface down on the coarse sand. The flies laid their eggs in the sand and the crevices between scales of the bulbs. If the water content of the sand was too high most of the eggs were deposited between the scales and egg production seemed less successful. Fine sand is also suitable for good oviposition. However, the coarse sand is much more convenient for egg collection by separating eggs and sand by flotation. When sufficient quantities of eggs were laid, the containers were filled with water and

stirred gently. The eggs floated, and were then decanted and filtered on fine mesh organdy which was fitted at the bottom of a small glass cylinder with a rubber band. After the eggs dried, they were transferred with a dried sable brush to the centre of the sand surface in the plastic case for larval culture as described below.

The coarse sand from which most eggs are removed should be washed with running hot water to kill any remaining eggs which may be left in the sand. This is necessary to get eggs or larvae of a definite age. Thus the container containing washed sand is re-usable for the next egg collection. At a temperature of 25-27°C, the larvae hatch in two days. Therefore, it is desirable to limit the oviposition period to less than two days by collecting eggs on the second day after setting up the ovipositional substrate. It is not difficult to get more than 500 eggs per day with 50-100 females in one cage.

When the eggs or newly-hatched larvae are required for experiments, it is desirable to use commercial onion powder (ca. 0.1g) sprinkled on moistened cotton pad in a small dish placed on the coarse sand instead of onion sections. This avoids the necessity of washing eggs soiled with onion juice and fragments of scales. However, fewer eggs are obtained with onion powder than with raw onions.

As a vessel for culturing larvae, plastic containers (20×8 cm) having lids with a ventilation hole (7 cm in diam.) covered with a fine mesh organdy were usually used. The eggs were placed on the sand in the centre and two or three onion bulbs of 150-200 g were cut into halves and inverted with the root region near the centre of the sand surface. This arrangement takes advantage of the observations of WORKMAN (1958) and NIEMCZYK (1964) that the larvae usually aggregate at the root region of the bulb.

The water content in sand should not be over 10%. If it is too high the onion rots quickly and bad odours are produced. Moreover, the larvae tend to pupate in the decayed onions so that it will need much more labour to collect the pupae. After 20 days at 25-27°C the pupae in the sand are floated out with water and collected by filtration through a screen. The larvae pupate from 10-14 days after egg inoculation but young pupae do not

¹ Appl. Ent. Zool. 2 (1) : 58-59 (1967)

float. From 300 to 400 pupae are easily obtained in each plastic case. The pupae contained in 1 gram number 85-100. The pupae are placed on moistened vermiculite. More than 90% of the flies emerge within 10-14 days.

There are two main advantages in this rearing method: 1. Onion pieces (e.g. thirds or quarters) or onion powder, instead of onion plants are used. This means that a simple fly cage with a sleeve is adequate for both oviposition substrate and for adult food, and the labour of planting onions is eliminated. 2. Sand instead of soil is used as a medium for pupation, thus eliminating the labour of washing when collecting pupae. As previously indicated, successful separation of the pupae by flotation can be done only at a late stage of pupal development. These procedures dispense with the screening in NIEMCZYK's (1964) method and with the mechanical separator devised by LAFRANCE (1953) and LAFRANCE and PERRON (1956). However it is likely that the food for flies recommended by NIEMCZYK (1964) would require less labour than that described herein.

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Received September 15, 1966

On the Cocoon of *Eisenia rosea* SAVIGNY (Neoligochaeta: Lumbricidae)²

A number of specimens of the lumbricid earthworm, *Eisenia rosea*,³ not previously reported from Japan, were first collected at Tomamae Town, Hokkaido, in 1963 (Hokkaido Kaihatsu-kyoku, 1965) by Keiji YOSHIDA of Hokkaido Kaihatsu-kyoku (Development Bureau). He collected several cocoons of the same species on May 10, 1966, from the same town at a depth of 15-20 cm in the soil of a sasa grass field, and gave five of them to the writer for examination. The writer himself collected seven cocoons on May 25, 1966, in addition to fifteen adults and some young from Hiroshima Village near Sapporo at a depth of about 20-25cm in the soil of a cultivated field. So far as the writer knows, no previous record concerning the cocoon of *E. rosea* as well as the emergence of the young from it is available at present and this paper deals briefly with these problems.

The cocoon of *Eisenia rosea* is brown and more or less ovoidal. The main body, 6.2-10.1 mm long and 4.6-6.2 wide, has rather thin, short processes, 1.1-1.5 mm long and 0.2-0.3 mm wide, at both end (Fig. 1). The weight of eleven cocoons varied from 139.3 to 181.6 mg with the sample mean of 147.6 ± 10.2 (confidence limits) mg. It is decidedly larger than the cocoons of *E. foetida* and *Allolobophora caliginosa* of the same family, Lumbricidae, and of *Pheretima hilgendorfi* of Megascolecidae, according to Dr. YAMAGUCHI (personal communication), being nearly as large as the cocoon of *Drawida hattamimizu* of Moniligastridae (OHFUCHI, 1938).

The cocoon shrinks somewhat when left dry, but reswells rather quickly, usually in a few minutes at room temperature, when placed on moistened filter paper. At about the time when the segments of the young become visible through the semitransparent wall of the cocoon, the animal may be seen to move rather slowly within the cocoon capsule. Soon afterwards it leaves the capsule

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² Appl. Ent. Zool. **2** (1) : 59-60 (1967)

³ The identification was made by Dr. Hideji YAMAGUCHI.