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A Rapid Suction Method for Selective Collection of Small Beetles from Mass Culture¹

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It is often necessary to deal with a large number of a certain type of insect in bioassay. Usually, insects are picked up individually with tweezers or writing brush from culture media or host plants. This method is not only laborious but also involves the possibility of injuring them. A simple method is described here for the rapid collection of small beetles. This is a modified method of JOHNSON et al. (1955, 1957) and SAUFLEY (1973), which was originally developed for sampling various stages of aphids or elm span worm from host plants.

The principle of this method is to select the individuals from amongst a crowd in an observation box and to pick them up with a suction sampler (Fig. 1). The box is trapezoid in the side view with the width at the bottom and the top being 270 mm and 200 mm, respectively, and has a height of 65 mm and a depth of 270 mm. Only one of the four side walls is oblique while the rest are vertical to the bottom. The box is made of a kind of transparent plastic and its bottom is painted white for the easy recognition of blackish

Fig. 1. Overall view of beetle-collecting apparatus. A: observation box. B: glass nozzle. C: plastic collection tube. D: wire screen. E: vacuum cleaner. F: volt slider. G: foot switch. H: desk lamp.

beetles. A round opening of 25 mm diameter is present at the center of the oblique wall and is clogged with a rubber sheet which has a small hole. The suction sampler is made up of a long glass nozzle (5 mm in diameter, 240 mm in length), a methacrylic resins collection tube (10 mm in diameter, 45 mm in length) with a wire screen at the basal end, and a hand vacuum cleaner

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Fig. 2. Procedure for transfer of beetles from mass culture. A: observation box. B: funnel. C: writing brush. D: beetles on filter paper. E: rearing jar.

with voltslider for controlling the suction. The suction hole of the vacuum cleaner is plugged by a 1-hole rubber stopper mounted with an elbow methacrylic resins tube. The glass nozzle, the methacrylic resins collection tube, and the tube of the vacuum cleaner are serially connected with teflon tubes.

When in use, the observation box is placed on a stand as shown in Fig. 2, with the oblique wall sideways. A large number of beetles are released into the box. The lower 1/4 of the inner surface of the side walls is coated beforehand with a minimum quantity of mineral oil to prevent the beetles from crawling up from the bottom surface. As they crawl upward on the slope from the crowded bottom, one can see their external characteristics and behavior through the transparent wall from which one can examine the sex or reject the mal formed. From this setup one can collect beetles, for example, according to sex by the suction sampler, the glass nozzle of which has been inserted into the box through the hole on the oblique side wall.

This observation box may have an advantage over the conventional collection method. One can continuously observe all the beetles and easily collect suitable ones. When most beetles have come to the upper side, one can make them drop and cluster again on the lower side by shak-

ing or tapping the box. Thus this observing and collecting procedure can be repeated very easily. To transfer cigarette beetles from a rearing jar to this box, we recommend placing a filter paper in the jar beforehand. The paper on which the beetles are crowding, can then be removed and the beetles brushed off into the box through the funnel which is set in the top hole of the box (Fig. 2). For example, the adult cigarette beetle is very difficult to separate by sex, for there are no easily discernible external characters. The sexing so far has been based on the shape of the genital papillae of the pupa. While the adult females are generally larger than the males, one can assume the sex of individuals on the basis of body size. With the mass-observation method of this report, it is easy to collect each sex of typical-sized adults. The possibility of false selection is practically negligible. From our experiences, this is a highly reliable method, particularly in collecting gravid females.

The sucking power, which is triggered by a foot switch, is controlled by a volt slider. The sucked beetles enter the collection tube which can easily be replaced with an empty one.

This method has been successfully applied to cigarette beetles, *Lasioderma serricornis* FABRICIUS, drug store beetles *Stagobium paniceum* LINNE, saw-toothed grain beetles *Oryzaephilus surinamensis* LINNE, lesser grain borer *Rhizopertha dominica* FABRICIUS, and rice weevil *Sitophilus oryzae* LINNE. One can pick up 600 to 800 beetles per hour from about 3000 insects pooled from three culture lots. This may save approximately 70–80% of the time required by the conventional hand picking method. The insects are not injured by the suction sampler and are active as normal after collecting. This apparatus may be applicable to various stages of other small insects with slight modifications.

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