placed on the leaf within the aphid chamber. Mortality was observed and recorded after a 24 hr exposure period. Insects treated with the insecticide were kept at 25°C. Each experiment was repeated at least three times.

Results of contact and systemic insecticidal toxicity are shown in Table 1 and 2. From these results, LC50 values were calculated (Bliss, 1934) and are shown in Table 3 and 4. PSP-204 was remarkably low in toxicity to the coccinellid predator, whereas the other insecticides were highly toxic. Phorate and disulfoton were especially toxic, and their LC50 values after 48 hr were 20 and 50 ppm, respectively. All systemic insecticides used were markedly effective against the green peach aphid. LC50 values after 24 hr for dimethoate, PSP-204 and disulfoton were 6.5, 6.5 and 8.5 ppm, respectively.

Bartlett (1963) studied the contact toxicities of sixty-one pesticides to hymenopterous parasites and coccinellid predators, and found that virtually none of the materials tested were toxic to coccinellid adults while no toxicity to parasitic Hymenoptera was seen.

In order to compare the toxicities of the insecticides to the green peach aphid and the coccinellid, the “selective factor” was calculated by the following equation, using the LC50 values of the time indicated stable mortality:

\[
\text{Selective factor} = \frac{\text{LC50 value to the coccinellid after 48 hr}}{\text{LC50 value to the green peach aphid after 24 hr}}
\]

Values for PSP-204, phorate, dimethoate, disulfoton and vanidithion were 375, 0.48, 20, 5.85 and 6.23, respectively. According to the nomenclature proposed by O'Brien (1960), PSP-204 might be defined as a selective aphicide and phorate as a nonselective chemical, although the index value may differ from the experimental condition.

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Received September 19, 1973

The authors wish to thank Dr. Kisabu Iyamori for his valuable advice and encouragement. Acknowledgement is also made to Mr. Hachiro Honda for his technical assistance.

Some Biological Aspects of the Artificial Rearing of the Cucumber Looper, *Anaedivia peponis* (Fabricius) (Lepidoptera : Noctuidae$^{1,2}$)

An artificial method of rearing the cucumber looper, *Anaedivia peponis* (Fabricius), a well-known cucurbitaceous pest, was successfully established. It appears impossible for the looper to hibernate in the central and northern parts of Japan because of its non-diapausing nature throughout the developmental period. In Tokyo, eggs and pupae killed by frost are found in the field


$^2$ The author proposes a new English name “the cucumber looper” for this species, *Anaedivia peponis* (Fabricius), to supersede the old one, the cucurbita plusia, which is considered inadequate.
in late fall or early winter. Each year a small number of adult individuals which have presumably migrated from tropical or subtropical regions are first observed in June or July. Thereafter, the population increases gradually until it is decimated in winter. Stock cultures of this species have been maintained mainly by the author's artificial rearing method during the past three years (1971-1973) for studies of host plant specificity. Some biological aspects of this artificial rearing method shall be presented in the following discussion.

Rearing of adults. Five successive generations of the cucumber looper were successfully maintained on an artificial diet alone by adoption of the rotation breeding method (KAMANO and FUKAYA, 1965). In each generation, the pupae were sexed and kept at 15, 20 or 25°C and 80 to 100% R.H. (Table 2). The newly emerged females of one line were transferred to a wire-screen cage (28 × 24 × 38 cm) together with several males of another lineage. Absorbent cotton which had been soaked in a 6 to 10% unbleached sugar solution was provided as the adult food. Adults became sexually matured in 2 or 3 days after emergence at 20°C and mating was observed to occur around midnight on subsequent days.

Conditions suitable for mating were found to be as follows: (1) temperature between 18 and 28°C, (2) relative humidity higher than 60%, (3) flying space of about 30 × 30 × 30 cm, (4) presence of a moderate air current and occasional ventilation of the rearing room, and (5) a 12L : 12D photoperiod with reduced illumination (ca 0.3 lux) during the dark period. The conditions of high humidity and the rather large flying space were found to be imperative for mating. The relative humidity was automatically regulated at 70 to 80% with a humidifier.

Gravid females were allowed to oviposit in a glass pot (18 cm in dia. and 24 cm in depth) covered with a black-stained cheese cloth. Almost all of the eggs were deposited one by one onto the cloth during the first half of the dark period. The total number of eggs laid per female averaged 573 (ranged from 345 to 674; n=10) in the second generation.

Preparation of diet. The composition of the diet is shown in Table 1. This recipe was modified from those employed for the asiatic common looper, Plodia interpunctella (ICHIKAWA and CHIGUSA, 1966) and the cabbage looper, Trichoplusia ni (IGNOFFO, 1963; SHOREY and HALE, 1965). The concentrations of sodium solbate, methyl p-hydroxybenzoate, sodium dehydroacetate, salicylic acid and hydrochloric acid were determined on the basis of experimental results in which the most appropriate combination of the antimicrobial agents were evaluated. These chemicals were particularly effective against microorganisms, especially against infection due to an unidentified bacterium which multiplied almost solely in the diet devoid of these agents.

Ingredients except sodium ascorbate and hydrochloric acid (these were added after the sterilization) were preserved in a refrigerator as the well-mixed powder. In preparing the diet, the prescribed amount of water was added to the powder, then the mixture was steam-sterilized for about 40 min. at 100°C. The absence of ascorbic acid brought about a remarkable prolongation in larval growth, and a failure in fourth molting or in pupation. Sodium ascorbate was supplied once a week as a minute crystal powder by dusting into the rearing containers. The final pH in the diet just after preparation was 4.5 to 5.0.

Rearing of larvae. A piece of cheese cloth bearing about 50 eggs was placed on the bottom of a
small plastic container. Sterilization of eggs was not found necessary. One or two days before hatching, some slices of the diet were placed on a piece of cardboard, which was folded into a W-shape and positioned on the cheese cloth. The newly hatched larvae immediately began to feed and rested underneath the diet slices. The diet was freshly replenished once a week. When the larvae reached the fourth instar, they were transferred to a large plastic container (23 cm in dia., 8 cm in depth). This container could support about 70 larvae at 15°C, and about 40 larvae at 25°C for rearing. Photoperiodic conditions ranging from constant darkness to continuous lightness, had no detectable effect on the growth or development of the insect. Pupation took place in the delicate thin cocoon as in other members of this subfamily, and therefore pupae were removed very easily. The inoculated eggs yielded more than 80% adults. 100 to 140 g (dry weight) of the diet was required for the production of 100 healthy pupae of about 350 mg.

Results of rearing. The results of experimental rearing at the four different temperature conditions are summarized in Table 2. Eggs laid by one female of the third generation, which had been successively reared on the artificial diet, were used for the experiment. Group rearings, each of which consisted of 25 larvae, were conducted in constant darkness. The diet was renewed weekly. In control groups, a sufficient amount of fresh bur cucumber leaves was supplied daily.

Although prolongation in the larval duration and decrease in the pupal weight were inevitable to a certain extent under artificial rearing, insect vitality, expressed in terms of survival, fecundity, etc., did not differ from that of individuals reared on fresh leaves, and disadvantageous effects were not observed even in the fifth generation.

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Received September 28, 1973

1 The author is deeply indebted to Associate Prof. T. Ichinose, Tokyo University of Agriculture and Technology and Dr. Y. TAMAKI, National Institute of Agricultural Sciences for their many helpful suggestions, and also to Prof. Y. Matsumoto, University of Tokyo, for his critical reading of the manuscript.