

# ASSESSMENT OF SEX PHEROMONE ACTIVITY IN VIRGIN FEMALE MOTHS OF THE TEA TORTRIX (*HOMONA COFFEARIA* LEPIDOPTERA: TORTRICIDAE) AND ITS UTILIZATION IN MONITO- RING MOTH POPULATIONS IN TEA FIELDS

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Sex pheromone production was observed in virgin female moths of the Tea Tortrix *Homona coffearia* Neitner. Strong pheromone emissions were observed in virgin females 3 to 4 days old, whilst the younger and older virgin moths were found to have relatively low activity. Sex pheromone production in mated females ceased. Caged virgin females of this age group serve quite effectively in monitoring moth populations and thereby enabling the prediction of pest incidence-in-advance.

## INTRODUCTION

Adult females of many species of Lepidoptera are known to emit sex attractants (pheromones) which trigger a series of mating responses by the opposite sex (Jacobson 1965; Shorey *et al.* 1968). Sex pheromone studies have been carried out with many lepidopteran pests and pheromone activity has been effectively utilized to monitor moth populations in the field. These monitoring programmes now form an integral part in several pest management strategies (Shorey *et al.* 1964; Roelofs *et al.* 1970; Roelofs *et al.* 1972).

Sex attraction by pheromones is quite prevalent among the Tortricidae. Different species are known to be attracted very specifically to their respective pheromones, and some correlation has been found between taxonomic grouping and pheromone structures (Comeau and Roelofs 1973).

Tamaki *et al.* (1971) have isolated two compounds with sex pheromone activity from female moths of the smaller Tea Tortrix (*Adoxophyes fasciata*) in Japan. The current experiment was undertaken to detect the possible presence of sex attractants in the larger tea tortrix virgin female moths (*Homona coffearia* Neitner) that occur in the tea fields of Sri Lanka and to investigate the possibility of using caged virgin females in the field to monitor moth populations. These studies may be useful in monitoring tortrix moth populations in tea fields and predicting potentially serious attacks, and possibly adopt suitable control measures to prevent economic loss.

## MATERIALS AND METHODS

A cylindrical trap made of galvanized sheeting, 46 cm long and 18 cm in diameter was used in this study. The virgin female was enclosed in a small cylindrical galvanized wire mesh cage (50 mesh), 5 cm long and 4 cm in diameter, which in turn, was suspended within the cylindrical galvanized trap as shown in Fig 1. The inner surface of the trap was lined with paper coated with a tanglefoot adhesive ('Stickem'). The trap assembly was suspended about 90 cm above the plucking table of tea plants.

To assess the efficacy of sex attractant emissions from active virgin female moths, the following controls were set up along with traps containing virgin females to monitor moth populations in the field: cages containing (a) no moths, (b) male moths,

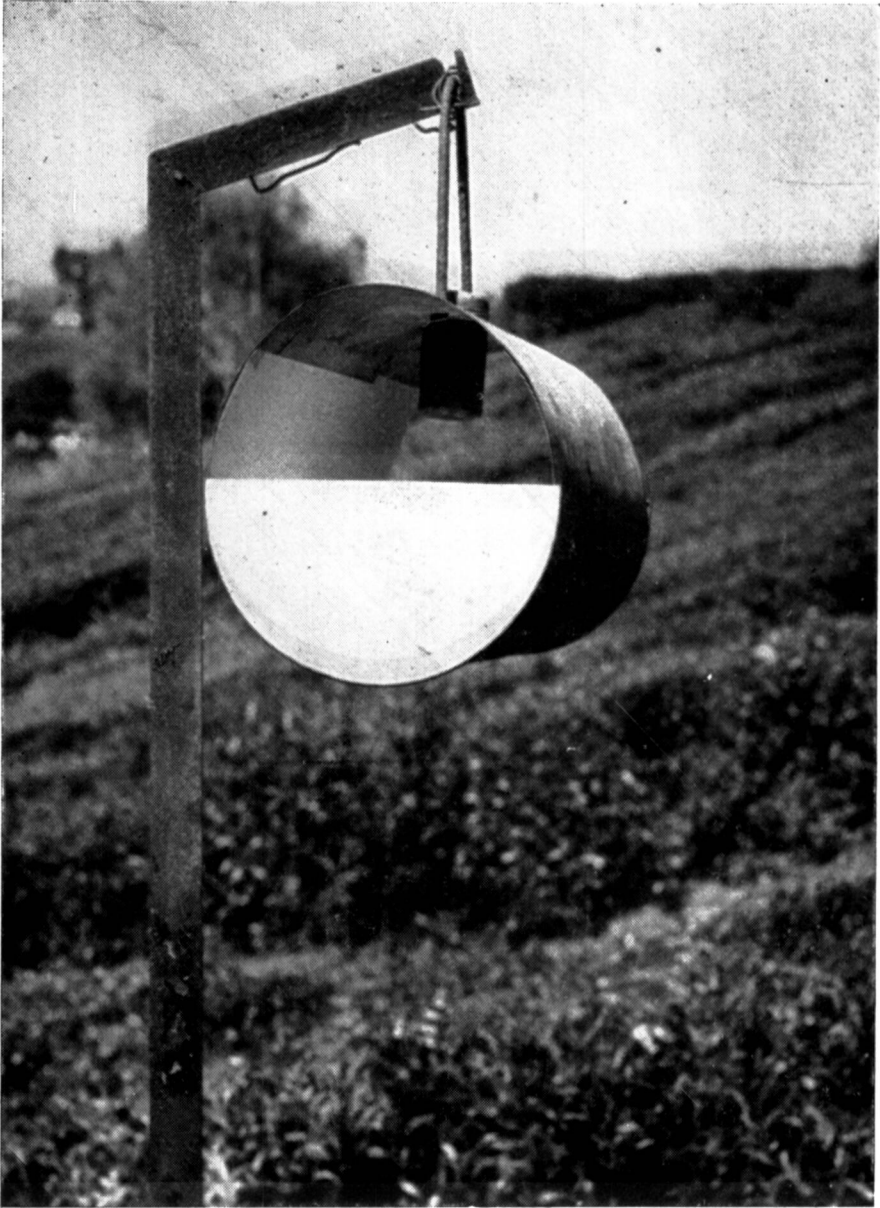


FIG. 1.—Moth trap with virgin female of *H. coffearia* in galvanized wire cage within trap

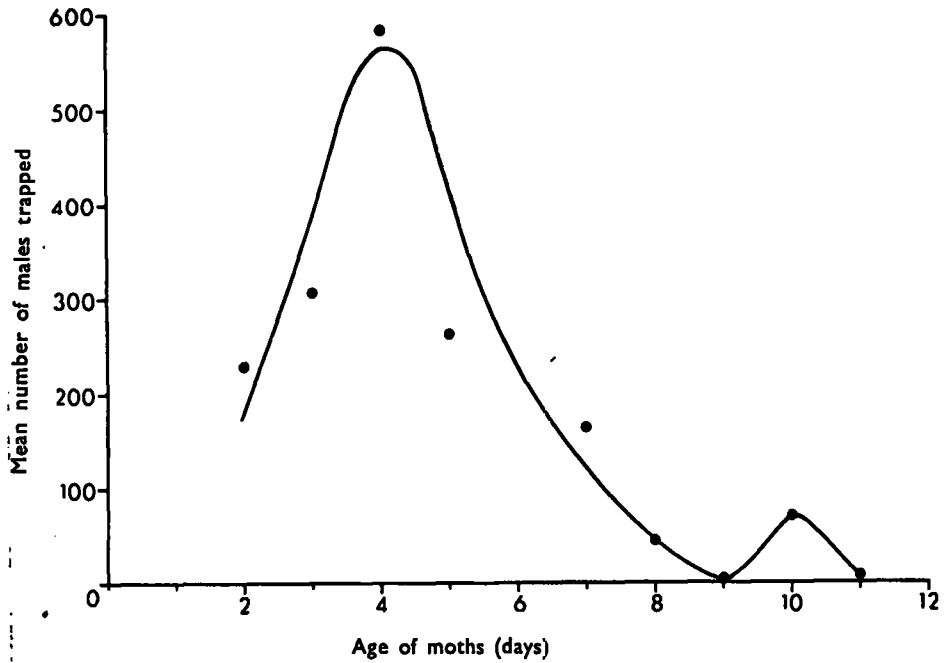


FIG. 2—Sex pheromone production by virgin female moths of *H. coffearia* in relation to age

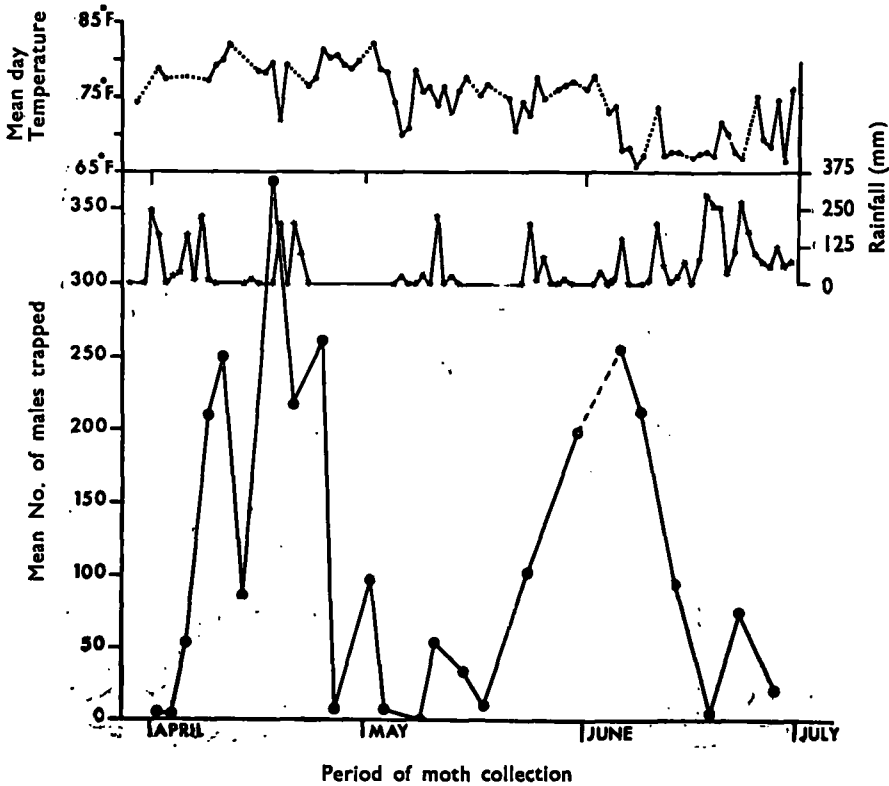


FIG. 3—Monitoring flight of male moths of *H. coffearia* during pest season

(c) mated females, (d) cotton wool dipped in a crude ether extract of virgin female abdominal tips, (e) a dissected abdominal tip of a virgin female and (f) a pupa of a female moth. Traps containing virgin females of varying age ranging from freshly emerged females to those about 10-12 days old, were utilized to assess the relationship between age and sex-pheromone activity. Eight traps containing active virgin females were set up in a field at St Clair Estate, Talawakele, in an area of about 0.2 ha. The selected site was on a gentle slope surrounded by tea that had been attacked by Tea Tortrix. The traps were set up 19.5 m apart within this experimental area with the long axis of the trap directed in line with prevailing south western wind currents. Moth collections were monitored at 48 and /or 72 h intervals. The experiment continued from April through June, covering a good part of the tortrix season. The dead females in the cages were replaced with freshly-emerged females, as and when required. This replacement frequency was about the same in all cages (about 12 days intervals). A daily record of air temperature and rainfall was maintained throughout the experimental period.

## RESULTS

Traps containing active virgin females were found to attract large numbers of male moths. Those containing the various control materials, however, failed to trap any moths during the entire experimental period. The number of male moths trapped in units containing active virgin females was very large and there was little variation between replicates.

The mean counts of trapped moths assessed in relation to the age of the virgin females in the traps, are given in Fig. 2. The mean counts of trapped moths during the entire experimental period are given along with rainfall and day temperature records in Fig. 3. As the number of moths trapped after the last week of June was negligible, the experiment was then terminated. It is seen from Fig 2. that the very young virgin females were able to attract only a few moths. This ability to attract increased to a peak when they were four days old and thereafter declined rapidly with increasing age. There were two distinct peaks of moth flight activity (Fig.3), a large peak in mid April and a smaller one in mid June. This pattern of flight activity did not appear to be correlated with rainfall or temperature.

## DISCUSSION

It is evident that virgin females of *H. coffearia* attract large numbers of male moths. These findings have shown that this strong attraction to male moths is due to the emission of a sex attractant by virgin females. Despite the fact that eight traps were set up 19.5 m apart, within the relatively small area of 0.2 hectares, large collections were made per trap.

Male moths and other control materials including mated females, cotton wool dipped in ether extract of virgin female abdominal tips, dissected abdominal tips of virgin female and pupae of female moths, used in place of active virgin females, failed to attract any male moths. This is indicative of a powerful sex pheromone activity. It is interesting to note that mated female moths stop producing sex attractants.

Even with virgin females there was hardly any sex pheromone activity soon after emergence from the pupal case. Peak activity was observed when the female was 3 to 4 days old, and seems to decline rapidly thereafter. For proper monitoring programmes it is therefore necessary to employ virgin females 3 to 4 days old.

Since the experiment commenced during the first week of April 1973, the first peak moth collection was made during mid April as shown in Fig. 3. A serious caterpillar outbreak was subsequently observed during mid May. Earlier inspections

of this field revealed a high incidence of caterpillar damage during mid February. It is possible that the peak flight of moths observed in this experiment could have been the second generation of moths for the season. It is also conceivable that a peak moth flight would have preceded the initial high caterpillar incidence observed during mid February, sometimes during early January.

The high incidence of caterpillar damage during mid May was followed by a second relatively smaller peak of trapped moths in early June, as shown in Fig. 3. No further high incidence of caterpillar damage was observed after this time. A high percentage of the residual caterpillar population was found to be afflicted with a microsporidean disease after June.

The utilization of such virgin female traps reveal peak moth activity which is always followed by a corresponding caterpillar incidence. This monitoring system, therefore, seems to satisfactorily predict potential tea tortrix outbreaks.

When we are in a position to predict pest incidence and also have some estimate about the intensity of such occurrences, we would be in a better position to apply control measures at the right time. When such control measures necessitate the use of pesticides, the application could be timed quite accurately and the doses needed may be much less. This is particularly important when a pest is subject to biological control as the tea tortrix caterpillar is. We can then use minimal doses of insecticide to control a sudden flare up and do so at the right time.

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