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Social Feeding Behavior of Hyphantria Cunea Larvae (Lepidoptera: Arctiidae) in Multiple Choice Experiments

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SOCIAL FEEDING BEHAVIOR OF *HYPHANTRIA CUNEA* LARVAE (LEPIDOPTERA: ARCTIIDAE) IN MULTIPLE CHOICE EXPERIMENTS

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ABSTRACT

The response of fall webworm larvae, *Hyphantria cunea*, to identical feeding stimuli presented in a series of multiple choice tests was studied in the laboratory. Instead of responding independently, all larvae in 61% of the trials were observed to aggregate at one of two identical feeding stations.

In studies to determine the food preferences of insects and to screen insect attractants, arrestants, and feeding stimulants, we often have to decide whether to work with individual insects or with groups of insects.

The larvae of the fall webworm, *Hyphantria cunea* (Drury), are naturally gregarious. They build nests of silk in which groups of them feed together. However, earlier laboratory studies had shown that larvae of the "black race" (Oliver 1964) that were confined in 100 x 20-mm petri dishes, did not show a pronounced tendency to aggregate. Perhaps gregariousness was manifested only in the larger area encompassed by the nest.

This suggested a hypothesis, that larvae confined in such small areas act independently in feeding. To test this hypothesis we experimented with multiple choice tests to determine whether fall webworm larvae would act independently in feeding.

MATERIALS AND METHODS

The larvae were reared in the laboratory on the artificial diet described by Yearian et al. (1966). Newly ecdysed third-instar larvae were chosen at random for the feeding tests. The larvae had been fed on the artificial diet since hatching but had been starved for about 8 h before the tests.

Two plugs of the artificial diet were placed in 100 x 20-mm disposable petri dishes, at opposite edges (designated posts A and B; Fig. 1). Four larvae were released at the center of each of the 72 dishes in the experiment. After 24 h in a rearing chamber, the dishes were examined and the number of larvae at each diet plug was recorded.

Because the same diet was used at each post, the probability of a larva feeding at post A was assumed to be the same as that of feding at post B. It was assumed that each larva would select a diet post independently of the others and that no larva would refuse to feed. The binomial probabilities of the four outcomes of each trial were determined, and the theoretically expected frequencies were compared with the observed frequencies by the chi-square goodness-of-fit test (Sokal and Rohlf 1969).

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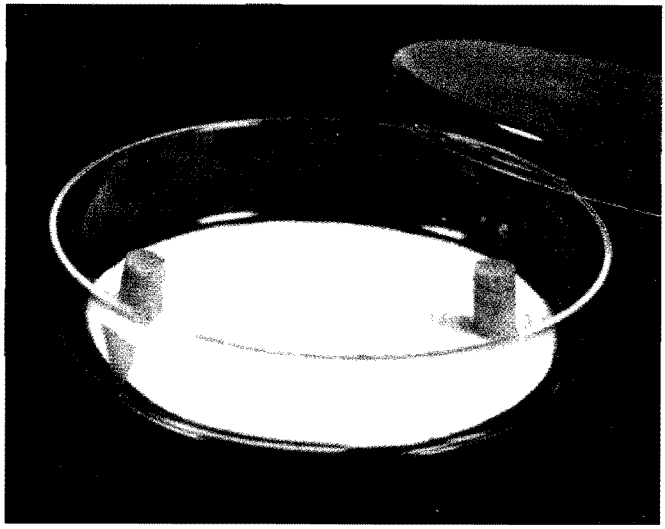

Fig. 1. Test arena used in food preference experiments.

Table 1. Distribution of fall webworm larvae at plugs of the same diet medium in a feeding preference experiment.

Number of larvae		Distribution of larvae (72 dishes)	
Post A	Post B	Expected frequencies	Observed frequencies
0	4	4.5	24
1	3	18.0	9
2	2	27.0	8
3	1	18.0	11
4	0	4.5	20

RESULTS AND DISCUSSION

The results show that the tendency of individual fall webworm larvae to feed on a particular plug was greatly influenced by other members of the group. In 44 of the 72 tests, all four larvae in the dish were found at one post (Table 1). In 20 tests, three larvae were at one post and one larva at the other post. Computed chi-square values showed a significant departure from expected frequencies ($\chi^2 = 158.5$, $P < 0.001$). The hypothesis that each larva would act independently in feeding was rejected.

It would appear that third-instar larvae retain their gregariousness under laboratory conditions. This colonial habit of the fall webworm appears to play an important role when newly hatched larvae are becoming established on host leaves. Groups of larvae have a higher rate of survival than an isolated larva (Watanabe and Umeya 1968). It is possible

that feeding by a larva attracts others to the feeding site, forming the beginnings of the colonial nest. This type of group feeding behavior has been reported for the jack pine sawfly, *Neodiprion pratti banksianae* Rohwer (Ghent 1960). Sawfly larval feeding groups were found to build up around a solitary larva that had begun to feed by itself. Additional larvae then joined the feeding site.

The results of this study and those of other researchers indicate that if the design of an experiment requires more than one insect to be used in a test arena, the hypothesis that the insects will react independently should be tested thoroughly.

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