RECIPROCAL HOST-PARASITE RELATIONS AS EXEMPLIFIED
BY CHRYZOMPHALUS AONIDUM [HOMOPTERA : DIASPIDIDAE]
AND PTEROPTRIX SMITHI [HYMENOPTERA : APHELINIDAE]

BY

D. GERLING & D. BAR

Department of Zoology, Tel-Aviv University, Tel-Aviv, Israel

The parasite Pteroptrix smithi (Compere) prefers to oviposit in hosts (Chrysomphalus aonidum L.) that are at least 5 weeks old. Parasitization of two week old hosts is possible, but only few parasitoids reach maturity, and the developmental duration is lengthened by about one third. The sex ratio with both large and small hosts was usually 1:2, whereas the average number of emerging parasites varied from 1.9 for 2 week old hosts to 3.4 for 5 week old ones. Non-ovipositing scales that are attacked by the parasite will fail to reproduce and ovipositing ones will only produce part of their potential progeny. Other externally observable changes in the young parasitized host include the formation of a thinner scale cover that differs in coloration and size from the normal one.

A host insect provides not only the sole nutritional medium for an insect parasite, but as is very often the case, constitutes the environment of its growth. Therefore, it is only natural that host-parasite relations may be reciprocal, i.e. the parasite may influence the host's longevity and fecundity whereas the host may influence the developing parasite's morphological, physiological and sexual characteristics. Clausen (1939), Salt (1940), Flanders (1946), Arthur & Wylie (1959) and Doutt (1959) have studied and reviewed the subject to some extent. Wilbert (1965) showed that the larger Aphelinus semiflavus, which developed upon the bigger hosts, have more ommatidia in their eyes and that they produce more eggs than smaller females which developed on smaller hosts. He found that there are unequal changes in the size of the body parts as a result of development in small or large hosts and concluded that these are genetically fixed and ensure the viability of small specimens, thus making the utilization of small hosts possible.

In the present work, the diaspine scale insect Chrysomphalus aonidum (L.), which is an important citrus pest in Israel, was used as a host and the aphelinid Pteroptrix (Casea) smithi (Compere) as the parasite. Hosts of different ages and stages were used to test
their influence upon parasite sex ratios, number of emerging parasites from each, and the duration of their development. The reciprocal situation, i.e. the influence of the parasite on the body of the host scale, was examined after having the former oviposit in hosts of different ages and by following the morphological and reproductive changes of the latter.

Materials and Methods

All experiments were carried out at 26 °C and 55 ± 5 % R.H. The host was reared on the fruits of "Butternut Squash" and the parasites were placed upon them as needed. Whenever a single-aged host population was required, a squash fruit was removed from the infestation cage a few hours after it was placed there. "Oviposition cells" were made from sections of a glass tube; each cell was glued to the squash so as to include some suitable hosts, and was covered tightly with silk-cloth. The cells were used for all experiments in which parasites were confined to specific hosts. The parasites were fed only honey, which was streaked on the cage or cell wall.

The influence of the host on the parasite

In order to be able to interpret the results of tests done with single-age populations of the host, it was first necessary to determine the host ages in which the parasites normally prefer to oviposit and the resulting sex ratios.

The selection test was done by exposing each squash once a week during six hours to scale crawlers, for 7 weeks. On the resulting population, that ranged in age from 1-7 weeks, 10 mated female parasites were released for 48 hours. Additionally, on each squash there were 4 oviposition cells with 8-12 hosts and one parasite female per cell. All scales were examined 2 days before expected emergence and the parasitized ones were isolated, their stage and age were recorded, and the parasites therein were allowed to emerge.

Fifty-five scales were parasitized by free oviposition and 46 of these gave rise to adult parasites. Twenty-two scales were parasitized in the oviposition cells and 21 of them gave rise to parasites.

The parasite females chose hosts that were at least 5 weeks old (Table 1). Younger hosts were not attacked at all, whereas above that age, the 6 weeks old ones seemed to be preferred to the 5 or 7 weeks old ones. The sex ratio remained 2 : 1 throughout and was not influenced by the host age (and size) within these limits.

Once the preference of the parasites was established, they were released upon single-aged host populations. The age of the hosts