THE COMPETITION BETWEEN ASOBARA TABIDA NEES VON ESENBECK, 1834 AND LEPTOPILINA HETEROTOMA (THOMSON, 1862) IN MULTIPARASITIZED HOSTS

I. THE COURSE OF COMPETITION

by

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SUMMARY

The course of competition between the solitary endoparasitoids Asobara tabida Nees von Esenbeck, 1834 and Leptopilina heterotoma (Thomson, 1862) in multiparasitized hosts (Drosophila melanogaster Meigen, 1830 and D. subobscura Collin, 1936) was followed in time. The outcome of competition was determined, as well as the mechanisms used by the parasitoids to eliminate a competitor and the moment at which this elimination occurred. The effect of various intervals between oviposition periods, of various temperatures, host stages and host species was studied.

The distinguish mortality due to competition from mortality due to other factors, the survival of the parasitoids in multiparasitized hosts was compared with that in singly parasitized hosts.

The results can be summarized as follows:

1. In multiparasitized hosts one of the two parasitoids is eliminated within a few days after the larvae have hatched, before they increase considerably in size. The survivor then has the disposal of the whole food supply; the type of competition that occurs thus is contest competition.

2. Elimination mostly occurs after hatching of the survivor; evidence is presented that it takes place in a number of hosts at least by means of a physical attack. In some cases, however, elimination seems to occur before the survivor hatches, so a second, physiological, mechanism may be involved. The moment of elimination depends on the temperature and the host species.

3. A. tabida and L. heterotoma both have a chance to survive in multiparasitized hosts under all circumstances studied. The values of these chances depend on:
   — the interval between the oviposition periods: when one of the parasitoids has a lead of one day its survival chance is 2 to 3 times as large as that of the second parasitoid; when both oviposit on the same day their chances to survive are about equal (in D. melanogaster, at 20°C).
   — environmental temperature: A. tabida is the better competitor at the lowest temperature studied (15°C), L. heterotoma performs better at the higher temperatures (20°C and 25°C) (in D. melanogaster; the interval between oviposition periods less than 6 hours).
   — host stage: both parasitoids have an equal chance to survive in early-second-instar hosts; in early-third-instar hosts this chance is also equal, though small (in D. melanogaster; at 20°C; the interval between oviposition periods less than 6 hours).
The outcome of competition in *D. subobscura* equals that in *D. melanogaster* (at 20°C; the interval between oviposition periods less than 6 hours). When both parasitoids oviposit on the same day the outcome of competition in hosts where *A. tabida* parasitized first is equal to the outcome of competition in hosts where *L. heterotoma* parasitized first in all situations studied.

4. *A. tabida* and *L. heterotoma* sometimes suffer a high mortality in singly parasitized hosts, dependent on host species, host stage and, for *A. tabida*, on environmental temperature. The eggs are then encapsulated. It was not always certain whether they already died before they were encapsulated.

In multiparasitized hosts a parasitoid egg that is susceptible to encapsulation is protected against encapsulation under certain circumstances by the presence of a competitor, and thereby has a chance to survive in multiparasitized hosts. Because of this protection, the percentage survival in multiparasitized hosts is not always lower than it is in singly parasitized hosts in spite of the occurrence of elimination.

In conclusion: the relation between *A. tabida* and *L. heterotoma* is rather complicated. They have to compete with each other, and their competitive abilities depend on the sequence of and the interval between ovipositions, the temperature and the stage of their host. Instead of being eliminated by their competitor, however, they sometimes are protected by this competitor against encapsulation by the host, and may have a chance to survive in multiparasitized hosts while they would be encapsulated in singly parasitized hosts.

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