DIFFERENTIAL REACTIONS TO ENVIRONMENT OF A HOST AND ITS PARASITE

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In a series of experiments involving the rearing of cocoons of the spider *Epeira gibberosa* some of which (approximately 50%) were parasitized by the Hymenopteran *Arachnophaga picea* information was obtained as to the relative rate of development and viability of each species under widely varying temperatures and humidities.[1] A summary of these results is presented in the accompanying diagram. Temperature, Fahrenheit, is indicated on the vertical axis and humidity horizontally.

The letter E indicates the optimum conditions for viability of the spider, i. e., humidity near 100% saturation and temperature in the neighborhood of 60°F. The area within the heavy continuous line marked 50% indicates conditions under which 50% or more of the spiders emerged from the cocoons. Similarly between the lines labelled 10% and 50% the viability is greater than 10% and less than 50%. Under conditions of low humidities (beyond the line designated by 0%), whether temperature is low or high, spiders do not emerge.

Similarily E_1, indicates the conditions under which the development of Epeira is most rapid—high temperature and high humidity. Rate of development is largely a function of temperature as is shown by the position of the dash and dot lines connecting points of equal growth rate.

A (temperature 90°, humidity 65%) indicates the optimum conditions for viability of *Arachnophaga*. The 50% line (light continuous line) delimits a relatively small area. The course of the 10% line is very peculiar, viability being over 10% at low temperatures (below 50%) and at high temperatures and low humidities. At moderate temperatures and humidities and high temperatures high humidities the viability is less than 10%. Rate of development (A_1, broken lines) varies somewhat as in the case of Epeira, except that it is slowed very greatly by low humidity.

The conditions most favorable for viability of the host and of its parasite are thus quite different, the most favorable conditions for the parasite being such that none of the hosts would develop normally, and the host living best under conditions affording approximately 10% viability to the parasite. It is of interest to note that most of the parasites which come to maturity emerge from cocoons which have been subjected to conditions which would have destroyed the developing spiders regardless of parasitism.

The conditions which favor the deposition of the eggs of the parasite in the cocoon are not known, but if these also are unfavorable for the development of the spider it would seem that there might be an adaptation in the direction of minimum injury of the host by the parasite.

The differences in conditions favorable for rapid development are less prominent and it is probable that these are unimportant in the host parasite relationship. In neither case are the conditions promoting the most rapid development coincident with those most favorable for viability. If the term optimum is to be used in the description of such relationships the life processes for which the given optimum obtains must be indicated.

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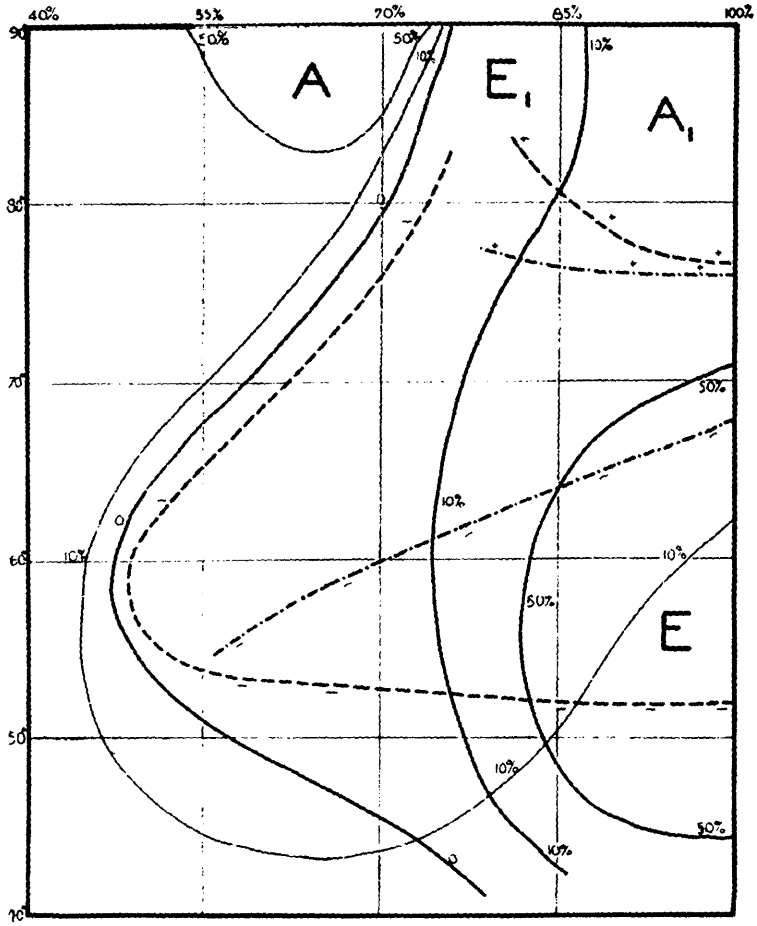
[1]Weese, A. O., 1924. Animal Ecology of an Illinois Elm-Maple Forest, Ill. Biol. Mono. 9:349-437.



—Viability Epeira (E)
—Viability Arachnophaga (A)
---Rate of Development Epeira (E.)
---Rate of Development Arachnophaga (A.)

PLATE II