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Variation in Tolerance to Starvation in Indian Natural Populations of *Drosophila ananassae*

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3 Tables

Zusammenfassung

5 Proben indischer *Drosophila ananassae*-Populationen wurden bei 25 °C auf Toleranz gegen Hunger-Stress mittels der „isofemale line“-Technik untersucht (mittlere Überlebenszeit ohne Futter, aber mit Wasser). Innerhalb einzelner Populationen gab es keine signifikanten Variationen der Toleranz gegenüber Hunger-Stress, während die Variationen signifikant zwischen den Populationen waren. Wichtig ist, daß Männchen und Weibchen unterschiedlich auf Hunger-Stress reagierten; Weibchen erwiesen sich resistenter als Männchen. Gleiche Ergebnisse traten auf, wenn dieselben Linien nach 3 Generationen unter Laborbedingungen untersucht wurden. Es wird somit klar, daß der Variation der Toleranz ein genetischer Mechanismus zugrundeliegt, der in Beziehung zu dem allgemeinen physiologischen und ökologischen Verhalten der Populationen steht.

Drosophila ananassae – Hunger-Stress-Toleranz – indische natürliche Populationen

Abstract

Five natural population samples of *Drosophila ananassae* from India were analysed for starvation tolerance (mean survival time without food but with water) at 25 °C by isofemale line technique. Within-population variation for the tolerance to starvation was not significant in all cases, but there was significant between-population variation. Most interestingly, males and females responded differently to starvation so that females were more resistant than males. Identical results were obtained when the same lines analysed after 3 generations in the laboratory condition. Thus, there is evidence for a genetic mechanism for the variation in the tolerance and this may well be related to the general physiological and ecological attitudes of the populations.

Drosophila ananassae – starvation tolerance – Indian natural populations

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1. Introduction

The correlation of abiotic environmental stress factors to the evolutionary biology of *Drosophila* has received increased attention in recent years. In *D. melanogaster*, tolerance to different stress factors could be mediated by a basic physiological process, namely a lower resting metabolic rate (DAVID et al., 1983; PARSONS, 1983, 1987; HOFFMANN and PARSONS, 1989; DA LAGE et al., 1990). It is expected from this presumption that the tolerance to starvation is dependent on the amount of available food in particular the lipids (DAVID et al., 1975), and also related to a lower metabolic rate and to other environmental stress (HOFFMANN and PARSONS, 1989). Until recently the physiological significance of starvation tolerance has been investigated (DAVID et al., 1975; DA LAGE et al., 1989) and compared between artificial selection lines (SERVICE et al., 1985; SERVICE, 1987). Recent studies on *D. melanogaster* provide evidence for both intra- and interpopulational variation in starvation tolerance in different natural population samples from Europe, North Africa, Afrotropical regions and India (DA LAGE et al., 1990; DAS et al., 1994a) and the involvement of genetic mechanisms in the tolerance is suggested.

In a tropical country like India with several species of *Drosophila*, this type of study is of great significance particularly in a species having a broad geographic distribution. India is located between 35° and 8°N latitude, so that several environmental factors are expected to vary between different regions in India. *D. melanogaster* and *D. ananassae* are widely distributed throughout this country and studies on population genetics of inversion polymorphism have been undertaken extensively in both the species (DAS 1994 for detail). Studies on the starvation and desiccation tolerance in some natural populations of Indian *D. melanogaster* have recently been undertaken (DAS et al., 1994a, b). However, nothing is known of *D. ananassae* although this species is very abundant in India and the genetics of the species is well known (TOBARI 1993 for details). In this paper we report on the variation in the tolerance to starvation in five natural populations of *D. ananassae* from India.

2. Materials and methods

Population samples of *D. ananassae* were collected at four localities in Orissa state and one in West Bengal (Howrah) during March–April 1993 by placing fermented banana baits in the domestic and semi-domestic places. Impregnated female individuals from each sample were used to construct isofemale lines by keeping single females in separate food vials. F₁ individuals of both the sexes were analysed. Altogether 10 isofemale lines of each sample were analysed and 30 individuals of each sex were subjected to starvation for each isofemale line. Prior to the starting of the experiments, the larvae were grown on a killed yeast food medium and the adults, on emergence, were distributed into groups of 10 individuals of each sex. Each group was fed on killed yeast medium for three days and then transferred to experimental vials (plastic, 60 ml. capacity) hermetically closed by a cap without any food. However, a piece of foam sponge impregnated with 2 ml. of water saturated with nipagine was provided to each vial in order to prevent any bacterial infection. It is expected under this condition that the relative humidity is close to 100 %. All experiments were conducted at 25 °C. After about 6 hours of experimental set up, each vial was observed at an interval of one hour and the number of dead individuals was recorded.

3. Results

Table 1 shows the mean survival duration \pm SE of male and female individuals in different natural populations of *D. ananassae*. With the exception of Cuttack, in all other populations females survive longer than males. In order to establish within- and between-population