
Strains of Drosophila melanogaster, either homozygous for the Adh<sup>F</sup> allele or for the Adh<sup>f</sup> allele were kept for a long time on food supplemented with ethanol. After 100 generations the survival of these strains (SSE and FFE) was compared with the survival of the control strains (SSC and FFC). Both in the juvenile and in the adult life stages the ethanol tolerances, expressed as median lethal doses (LD50) showed a significant increase (Table 1). In both life stages, however, no consistent relation with the in vitro ADH-activity was found. These findings are in contrast with those of McDonald et al. (1977), who reported increased ADH-activity and ADH-amount in a strain selected for increased tolerance to ethanol by exposing it to ethanol vapor. Perhaps the difference between their and our results can be explained by the difference in the employed selection procedure.

Table 1. Median lethal doses (LD50) of ethanol (% v/v) for the survival of adapted and the control strains; 95% confidence intervals given in parentheses.

<table>
<thead>
<tr>
<th>Adh-genotype</th>
<th>adult survival</th>
<th>egg-to-adult survival</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>control strain</td>
<td>adapted strain</td>
</tr>
<tr>
<td>SS</td>
<td>23.9 (23.1-24.7)</td>
<td>27.2 (26.3-28.1)</td>
</tr>
<tr>
<td>FF</td>
<td>28.3 (27.4-29.3)</td>
<td>30.2 (29.2-31.2)</td>
</tr>
</tbody>
</table>

It will be clear that the strongest selection takes place during the pre-adult life stage and consequently adaptation will mainly be induced during this life stage. Therefore it appeared promising to plot relative resistance of the selected and unselected strains for egg-to-adult survival.

Figure 1 shows that the curves of the two control strains (SSC and FFC) are not quite parallel, but their regression coefficients do not differ significantly as may be expected for 2 strains derived originally from the same population (Van Delden et al. 1978). The FFC strain will survive better on ethanol supplemented food compared to the SSC strain, because of the difference in ADH activity (Van Delden et al. 1975, 1978) and therefore the FFC curve lies below the SSC curve. The curve for the ethanol selected F strain (FFE) goes parallel to that of the FFC strain but has been shifted to the right; this is an indication that, in this case, adaptation has been induced by the Adh-locus only. In case of the SSE strain, however, the curve has not only been shifted to the right, but its slope has been altered too. Therefore also other loci are involved in the process of adaptation. The SSE and FFE curves show an intersection point at 21% ethanol and it can be
extrapolated that at higher ethanol concentrations SSE would survive better than FFE.

The overall conclusion is, that by keeping the strains on ethanol supplemented food, both the SSE and the FFE strains have increased their tolerance to ethanol significantly. The mechanism of this adaptation remains unclear because no consistent relations between ADH-activity and survival were found. It is clear, however, that the adaptation has not been realized in the same way for the S and the F strains. Furthermore, adaptation for the SSE strain has been relatively better than for the FFE strain.


Knoppien, P. University of Groningen, The Netherlands. No evidence for rare male mating advantage in Drosophila melanogaster for strains raised at different temperatures. (Dal Molin 1979; Grant et al. 1980). It has been shown that the rare male effect can be induced by different raising temperatures in Drosophila pseudoobscura (Ehrman 1966) and in Drosophila persimilis (Spiess 1968). In this paper it will be asked whether rare male mating advantage also occurs in Drosophila melanogaster for strains which differ only in raising temperature. The relevance for rare male mating advantage of a difference in male mating success, which was found between the strains, will be discussed.

All flies used were homozygous Fast for the alcohol dehydrogenase-locus, and derived from the Groningen base population (VanDelden et al. 1978). The flies for the mating experiments were raised as larvae and stored either at 20°C or at 29°C. Parents of these flies laid eggs in bottles, for 5 days at 20°C, or for 3 days at 29°C; each bottle contained 15 pairs. Composition of the food and methods for collecting and storing virgin flies are described by Pot et al. (1980). For each run of an experiment 50 pairs were used at a particular ratio of types (type is here defined as a group of flies raised at a particular temperature). Type frequency was varied simultaneously for both sexes. All mating experiments were done at 25°C, and lasted 30 minutes. Copulating pairs were removed from the mating chamber, while the type of each individual was recorded (see Pot et al. 1980 for further details). Flies were marked either with a minimal amount of red or green fluorescent dust for identification alternating the color between runs. To minimize possible effects of day to day variation in mating success on the frequency-dependent effect, experiments were conducted for all three ratios at the same day, varying the sequence in which the runs were done. Six runs were performed for each ratio at successive days. Virgin flies were six days old in three of these days and 12 days old in the other three days.

Differences in mating success were determined according to a method proposed by Pot et al. (1980). Following this method a mating chance ratio r was defined as follows. Let a be any given male of type A, any given male of type B, present in the mating chamber at a given moment. Then

\[ r = \frac{P(a \text{ is the next male to mate})}{P(b \text{ is the next male to mate})} \]

For statistical tests to determine whether r differs from unity, and to test whether r differs from one experiment to another, we refer to Pot et al. (1980).

The results are summarized in Table 1. For females no difference in mating success was detectable between flies raised at low and high temperature (P>0.1). On the contrary males raised at low temperature have a significant higher mating success than males raised at high temperature (P<0.001). It is suggested that this is the case because low raising temperature enhances size in Drosophila melanogaster. Large size generally enhances mating success for Drosophila species (Ewing 1961; Ehrman 1966). Differences between r-values were tested for each combination of ratios in order to detect any possible frequency-dependent effect. None of these tests gave significant results, nor for males nor for females.

It is suggested by some authors that differences in mating success between strains can give rise to a rare male effect (Bryant et al. 1980; Ewing 1978). According to Bryant et al.