Encuentro de Investigación *Buscando sinergias*
Alicante | 7 de junio de 2022 Hospital General Universitario Dr. Balmis de Alicante. Salón de actos. De 10:00 h. a 13:30 h.

Individual variation in Drosophila melanogaster impact feeding behavior

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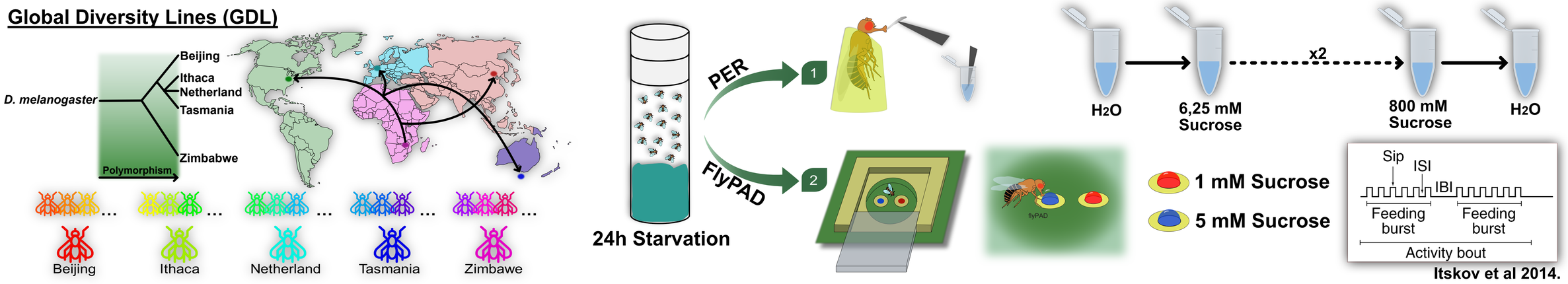
Abstract

In front of a stimuli, organisms from the same specie tend to behave apparently similar, but some aspects of the behavior can show huge variability among individuals. That phenotypic variation may emerge from genes and development, or even experience, that may impact on the survival of the organisms in the environment. The ability to detect chemicals and therefore initiate feeding or not often differs between species and populations, but also between individuals in the same population. Further, feeding behavior is context-dependent, being determined by the internal state of the animal and the social environment at the time to feed. Even if feeding behavior have been long studied in individual and collective context, the genetic bases involved in that variation are poorly understood. In addition to all the genetic tools available in *Drosophila melanogaster*, we use the isogenic *Global Diversity Lines* (GDL) to address the study of the feeding variation among individuals by analyzing the feeding microstructure at individual and collective context with different behavior assays. We have found that variation among GDL lines from the same population is lower than between GDL lines from different populations. Further, there are specific lines that show higher sensitivity to sucrose measured with Proboscis Extension Reflex (PER) which is also correlated with higher feeding activity according to FlyPAD assays. These findings suggest that there is a positive correlation between sensitivity to sucrose and two-choice activity, and that specific genetic background is responsible of these, which vary more between populations than within lines from the same population.

Methods



Results

1 Sucrose sensitivity variation of GDL flies

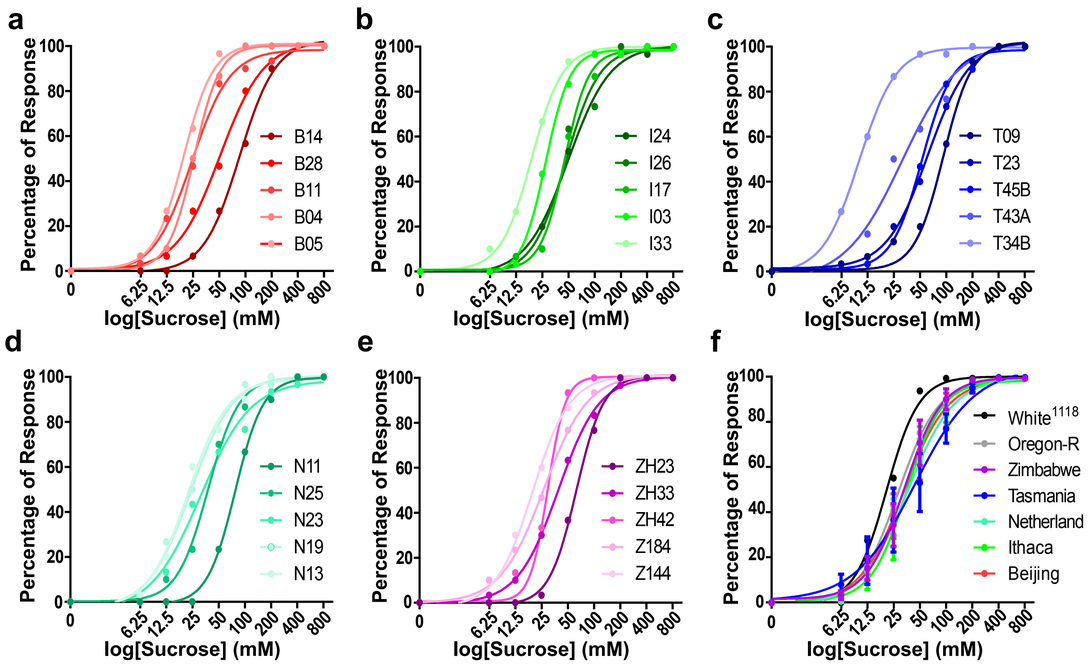


Figure 1. PER dose response curve for each GDL tested. PER response percentage mean for each line of Beijing (a), Ithaca (b), Netherland (c), Tasmania (d), Zimbabwe (e) and from the mean of each population, White^{1118} and Oregon-R (f). n = 30 for each GDL, White^{1118} and Oregon-R.

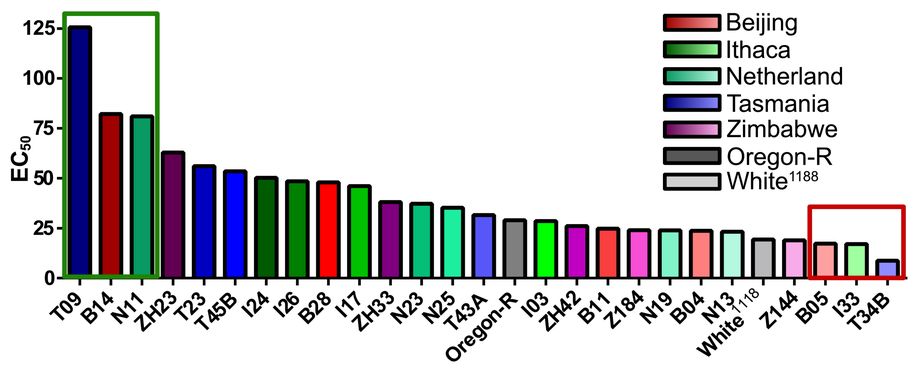


Figure 2. EC_{50} from the PER dose response curve. EC_{50} for each GDL, White^{1118} and Oregon-R. The three highest (green square) and the three lowest (red square) EC_{50} values were selected to test on the *FlyPAD*.

2 Two-choice microstructe feeding variation

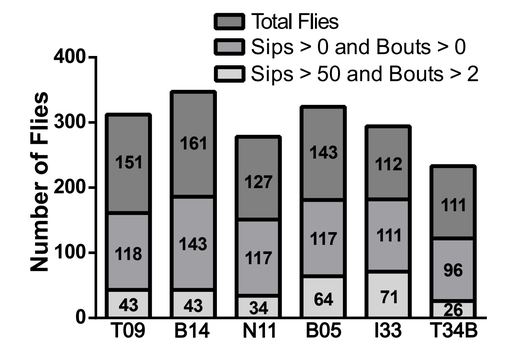


Figure 3. Sample size from each line obtained to test on the FlyPAD. Data is filtered by the number of total sips and bouts in order to get flies enough motivated to feed.

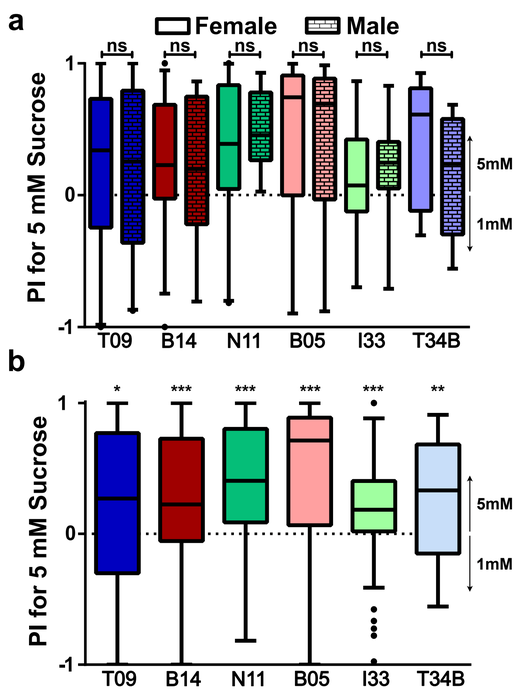
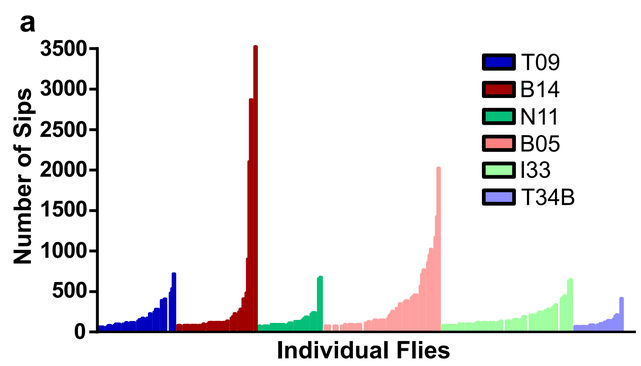


Figure 5. Flies display feeding preference for higher concentration of sucrose. (a) Preference Index (PI) for 5 mM of sucrose from fremales and males. **(b)** PI for 5 mM of sucrose. In green preference for 5 mM of sucrose and in red preference for 1 mM of sucrose. ns: non-significant, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (*t*-test for **a** and Wilcoxon test for **b**).



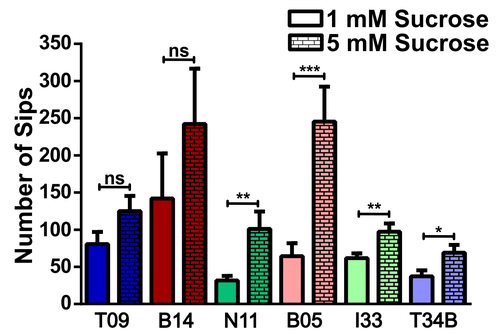


Figure 4. Sips distribución. (a) Total individual fly sips distribution for each fly line. **(b)** Mean number of sips both 1 mM and 5 mM of sucrose substrates. ns: no significance, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (*t*-test).

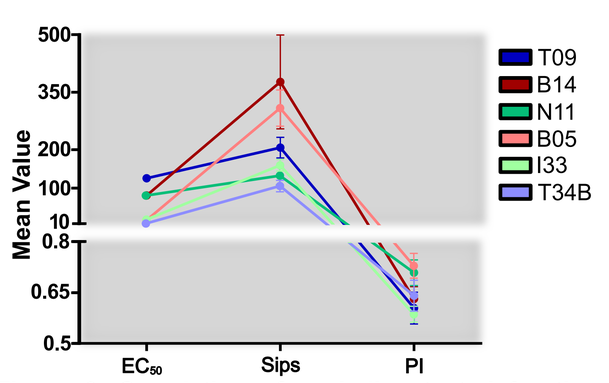


Figure 6. Correlation of each line tested for three microstructure feeding parameters. Correlation between EC_{50} from PER, total number of sips and PI for 5 mM of sucrose for each line.

Conclusions

- Sucrose sensitivity varies not only between populations but within GDLs of the same population.
- According to PER and EC_{50} values, GDL flies show a reproducible variation.
- B05 and B14 are the most active and motivated lines to feed considering the number of sips.
- There is not a clear correlation between the EC_{50}, the total number of sips and the PI for 5 mM of sucrose in the GDL tested.