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MICROBIOTA COMPOSITION AFFECTS LIFE HISTORY TRAITS IN *DROSOPHILA* SPECIES

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Introduction

Life history traits determine the survival of species and their reproduction and as such, they represent the main components of fitness. There are numerous factors that can affect life history traits, both external and internal. Microbiota is one of the factors that affects host fitness so better identification of the diversity of microbe communities and their interactions with hosts is a prerequisite in understanding the role of microbiota in the physiology, ecology and evolution of insects.

Material and methods

We investigated the influence of the composition of microbiota on two life history traits, egg to adult viability and developmental time, in two species, *Drosophila melanogaster* and *Drosophila subobscura* grown in laboratory on standard (over 50 generations) and lead (II) acetate ($Pb(CH_3COO)_2$) saturated substrates (over 30 generations). The composition of microbiota in larvae and adults was determined by sequencing (NGS) of the V3-V4 variable regions of the 16S rRNA gene.

Results

The relationship between changes in the composition of microbiota and studied traits were analyzed. In *D. subobscura,* developmental time shows a higher tendency of slowing down on lead saturated substrate compared to *D. melanogaster*. Reduced viability in *D. melanogaster* could be a cost of faster development and presence of endosymbiotic bacteria (*Wolbachia*). Microbiota diversity indicates that the high prevalence of genus *Komagataeibacter* could be a key to better tolerance of lead pollution in *D. subobscura*.

Table 1. Summary of results of ANOVA on (a) egg to adult viability, (b) developmental time, (c) sex differences within species and substrates, (d) sex differences within species and populations

Trait	Effect	df	MS	F	p
(a) egg to adult viability	Population	1	0.1387	11.51	0.000813
	Substrate	1	0.4412	36.61	0.000000
	Species	1	1.1030	91.53	0.000000
	Population*Substrate	1	0.2059	17.09	0.000050
	Population*Species	1	0.0189	1.57	0.211654
	Substrate*Species	1	0.8604	71.40	0.000000
	Population*Substrate*Species	1	0.1349	11.19	0.000957
(b) developmental time	Population	1	0.2	0.5	0.488869
	Substrate	1	163.2	340.0	0.000000
	Species	1	230.2	479.7	0.000000
	Population*Substrate	1	9.0	18.7	0.000022
	Population*Species	1	5.3	11.1	0.000997
	Substrate*Species	1	26.9	56.1	0.000000
	Population*Substrate*Species	1	2.2	4.6	0.033154
(c) sex differences within species and substrates	Substrate	1	15068	15.735	0.004138
	Species	1	6281	6.559	0.033593
	Sex	1	2377	2.482	0.153813
	Substrate*Species	1	12045	12.579	0.007546
	Substrate*Sex	1	885	0.924	0.364506
	Species*Sex	1	105	0.110	0.748974
	Substrate*Species*Sex	1	264	0.276	0.613729
(d) sex differences within species and populations	Species	1	6281	1.6156	0.239423
	Population	1	1785	0.4592	0.517125
	Sex	1	2377	0.6113	0.456804
	Species*Population	1	2525	0.6495	0.443578
	Species*Sex	1	105	0.0270	0.873499
	Population*Sex	1	452	0.1162	0.742020
	Species*Population*Sex	1	60	0.0154	0.904146

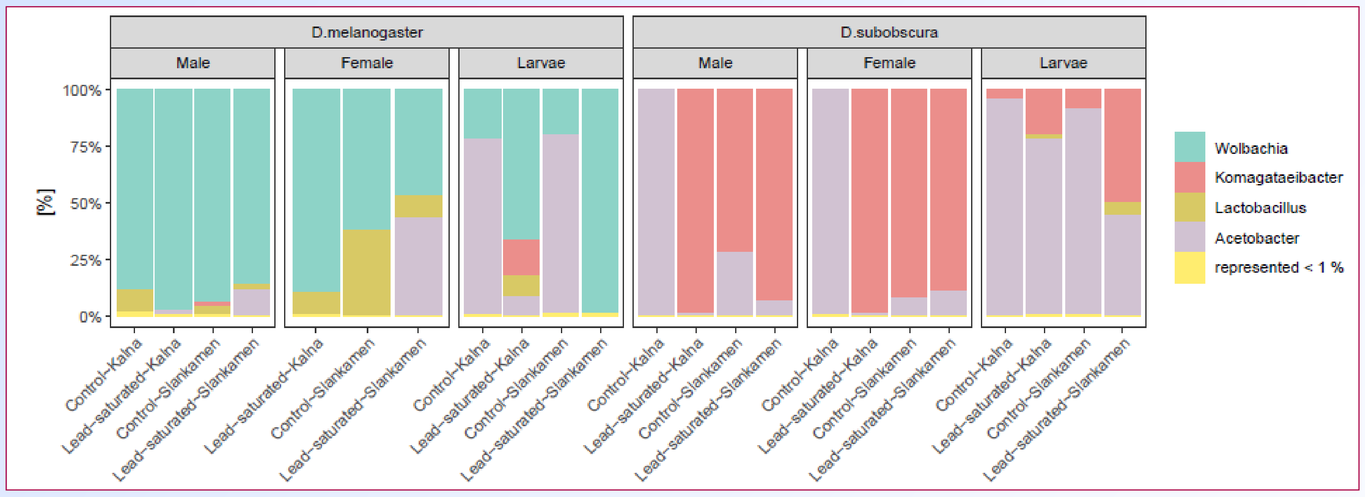

Figure 1. Microbiota composition in two populations (Kalna and Slankamen) of *D. subobscura* and *D. melanogaster* (male, female and larvae) on standard and lead saturated substrate, at the genus level

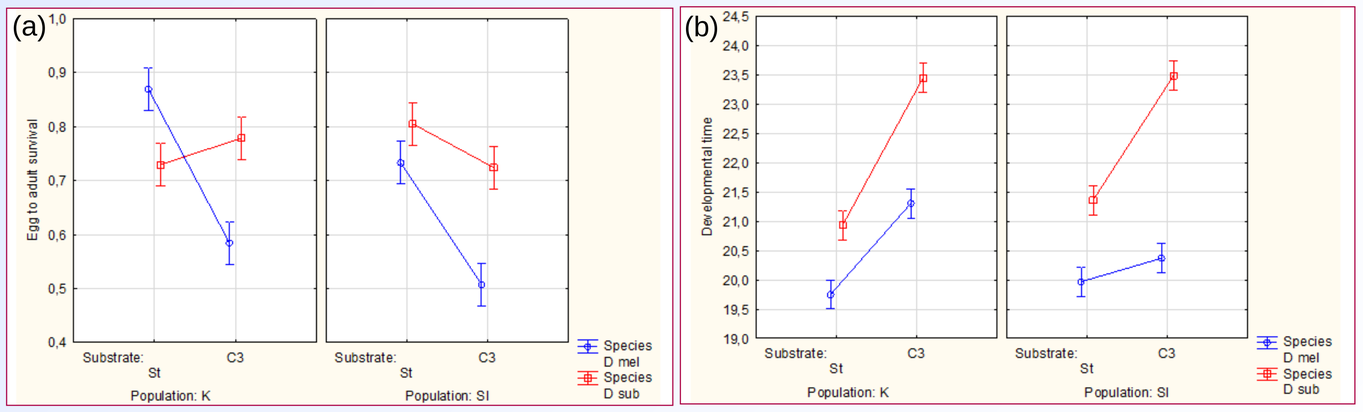

Figure 2. (a) LS Means of egg to adult viability of the population*substrate*species analysis. Current effect: F(1.232)=11.195, p=0.00096. Vertical bars denote 0.95 confidence intervals;
(b) LS Means of developmental time of the population*substrate*species analysis. Current effect: F(1.232)=4.5925, p=0.03315. Vertical bars denote 0.95 confidence intervals.

Conclusions

- ✓ The substrate × species interaction shows a significant effect on both fitness components.
- ✓ Reduced viability could be a cost of faster development.
- ✓ High prevalence of genus *Komagataeibacter* could be a key to better tolerance of lead pollution.
- ✓ The study of additional factors that may affect the composition of the microbiota, and consequently the potential trade-offs among different life history traits is of great importance in evolutionary research.