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Differential body expression of isoenzymatic loci in adults of the *Drosophila mediopunctata* (Diptera: Drosophilidae).

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Abstract

Several works have been done on protein and isoenzyme polymorphisms using different organisms, including *Drosophila*. More recently, a combined data analysis of isoenzyme loci, DNA sequencing, and morphology has been proposed producing better results about the history and genetic structure of populations. *Drosophila mediopunctata* has many characteristics that make it an interestig model for studies of evolution and population genetics. Thus, the aim of this work was to detect isoenzymatic differential body expression in *D. mediopunctata*, with the purpose of providing the pattern of expression as a tool for future combined works using isoenzyme, DNA, and morphology data. Our results demonstrated that it is possible and suggest that the DNA extraction should be carried out using the head, leaving the remaining parts for isoenzymatic assays.

Introduction

Drosophila mediopunctata belongs to the *D. tripunctata* group, which is endemic of the Neotropical region and includes 64 nominal species (Vilela and Bächli, 2000; Klaczko, 2006). It is the second larger Drosophilidae group in this region and the largest group of the genus that occur in the Neotropical forests. In high altitudes and the cool season, *D. mediopunctata* is the more currently found species of the group. According to Klaczko (2006), this species has many characteristics that make it an interestig model for studies of evolution and population genetics.

The electrophoresis technique has been used by evolutionary and population geneticists since 1966, because it offers a way to evaluate the population genetic variation through the direct product of gene expression (Mateus *et al.*, 2005). Several works have been done on protein and isoenzyme polymorphisms using different organisms, including *Drosophila*. In many of these works, there is a preoccupation to relate the variation found in natural populations with several environmental aspects, and also with enzyme structure and functions, since the isoenzymatic approach is very important for

population genetic variability studies. More recently, it has been proposed to combine data analysis of isoenzyme loci, DNA sequencing, and morphology to produce better results about history and genetic structure of populations (Estoup *et al.*, 1998; Dufresne *et al.*, 2002; Mateus *et al*., 2005).

Thus, the aim of this work was to detect isoenzymatic differential tissue expression in *Drosophila mediopunctata*, with the purpose to provide the pattern of expression as a tool for future works of combined isoenzyme, DNA, and morphology data.

Material and Methods

Eighteen adult specimens of *Drosophila mediopunctata* were collected in the "Parque Municipal das Araucárias" (25º23'36"S, 51º27'19"W), located in the municipality of Guarapuava, Paraná state, Brazil. The three main body segments of these insects (head, thorax, and abdomen) were separated. Seventeen samples were prepared for electrophoresis, six containing three heads each, six with three thoraxes each, and five with two abdomens each. These samples were submitted to gel eletrophoresis and isoenzymatic loci analysis according to Mateus and Sene (2003), and the isoenzymatic body expression pattern was researched.

Results and Discussion

The results were qualitatively analyzed accordingly to the isoenzymatic expression levels used by Mateus *et al*. (2005), with modifications: very low, low, high and very high expression (Table 1). Eight isoenzymatic systems were analyzed, resulting in 11 different loci. The head showed qualitatively significant expression (high or very high) of only three loci (*Est-1*, *Hk* and *Pgm*). On the other hand, the abdomen showed non-significant expression (low or very low) of only two loci (*Est-1* and *Est-2*). Although thorax has showed the larger number of loci with very high expression level (*Est-1*, *Est-2*, *Mdh-2* and *Me*), it also had five loci with non-significant expression (*Est-3*, *Gpdh*, *Hk*, *Lap* and *Pgm*).

Table 1. Qualitative analysis of isoenzymatic body expression pattern of *Drosophila mediopunctata*. + = very low expression; ++ = low expression; +++ = high expression; ++++ = very high expression.

Loci	Head	Thorax	Abdomen
Est-1	++++	++++	+
Est-2	++	++++	++
Est-3	+	++	+++
Gpdh	+	++	++++
Hk	+++	+	+++
Idh	+	+++	+++
Lap	+	++	+++
Mdh-1	++	+++	+++
Mdh-2	++	++++	+++
Me	++	++++	+++
Pgm	+++	+	+++

Our results revealed that it is possible to perform a combined analysis using isoenzymes, DNA, and morphology for the *Drosophila mediopunctata* natural populations as the DNA extraction can be carried out with the head, leaving the remaining parts for isoenzymatic and morphological approaches.

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