Abstract

Enzymatic activities of bacteria isolated from the digestive tract of caterpillars and the pupal content of Automeris zugana and Rothschildia lebeau (Lepidoptera: Saturniidae). The enzymatic activities of bacteria isolated from the digestive tracts of caterpillars and the pupal contents of Automeris zugana and Rothschildia lebeau was studied. This digestive tract represents an extreme microenvironment due to its high pH and presence of antimicrobial substances secreted by the insect or derived from ingested plant tissue. At the same time, it contains large amounts of nutrient-rich food, for which microbes may compete among themselves and with the caterpillar. There is little information about the microbiota associated with tropical caterpillar guts, although bacteria from different genera have been isolated from gut and pupae samples. The study of the enzymatic activities generated by these organisms constitutes a starting point to understand their metabolic and physiological relationships with their hosts, and to find enzymes that have potential biotechnological applications. In this study we evaluated several enzymatic activities in two collections of bacteria isolated from caterpillar guts and pupae of the tropical lepidopteran species A. zugana and R. lebeau. Bacteria grown under aerobic conditions were tested for an array of enzymes, including gelatinases, caseinases, lipases, esterases, cellulases, xylanases, amylases and chitinases. Both collections displayed similar patterns of enzymatic activity. No isolate showed activity for all enzymatic tests, but as a whole, at least some bacteria in each collection were able to degrade each substrate tested. Isolates with the same taxonomic identification obtained from caterpillar guts and pupae had almost the same enzymatic activities. In both collections, it was possible to group bacterial isolates according to their enzyme activity pattern. In addition to a heterogeneous ensemble of isolates exhibiting two or less enzymatic activities, there were two groups with at least five activities that showed an apparent specialization for the substrates they were able to use. The first consisted exclusively of isolates of the family Enterobacteriaceae, which were positive for lipolytic and chitinolytic activities, but completely lacked amylasic, cellulolytic and xylanolytic activities. The second group, composed mainly of Gram-positive rods, exhibited the opposite pattern: they were positive for amylasic, cellulolytic and xylanolytic activities, lacked chitinolytic activity and had few isolates with lipolytic activity. This work forms the foundation for future research to explore the biotechnological potential of bacterial isolates from caterpillar guts. Rev. Biol. Trop. 55 (2): 401-415. Epub 2007 June, 29.
Keywords
Saturniidae, caterpillar, bacterial enzymes, Automeris zugana, Rothschildia lebeau, Área de Conservación Guanacaste, Costa Rica.