

## **Pest Thrips of the World — Visual and Molecular Identification of Pest Thrips, Cd-Rom**

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MORITZ, GERALD, O'DONNELL, CHERYLE, AND PARRELLA, MICHAEL. Pest Thrips of North America Associated with Domestic and Imported Crops. Cd-rom published by CBIT, Brisbane. Price 59.00 Australian dollars. <http://www.lucidcentral.com/Default.aspx?id=219&tabid=217>

In 2005, the University of California announced on its web site a USDA award of \$345,000 to Michael Parrella, for the development of a "New Diagnostic Key for the Identification for Pest Thrips of Potential Threat of Importation on Plant Material." The cd-rom considered here is the outcome of that grant, and it is interesting to consider what USDA has received in return for one of the largest grants ever given to any study on thrips. On the cd-rom case is the statement, "We propose this novel key to be a supplement to morphology based identification for adult females. . . . The rapid molecular method included in this key will provide accurate identification of both eggs and larvae." The cd-rom itself includes the following 3 statements: "The most important focus of this key is the molecular methods designed to rapidly (24 h) identify thrips eggs, larvae or adults that are intercepted"; "The ITS-RFLP diagnostic method utilizes an electrophoresis gel pattern of 5 enzymes"; "This method quickly and accurately diagnoses live thrips of any life stage for those species included in the key." This review considers the extent to which the product achieves the authors' objectives.

The morphology-based key provided on the cd-rom includes 81 species of Thripidae and 10 species of Phlaeothripidae. Using Lucid 3.4 software, the first author has provided an efficient and user-friendly identification system, in which characters and species are all well illustrated with appropriate photomicrographs. However, of the 81 Thripidae included, 73 are among the 99 species in "Pest Thrips of the World" (Moritz et al. 2004), and 59 are among the 250 species in "Thrips of California" (Hoddle et al. 2008), a system that treats native and exotic as well as potential invasive species. Only 3 Thripidae species in the new system are not dealt with in 1 of these 2 previous systems; 1 is a pest of Linden trees in eastern North America, 1 a pest on beans in India, and the other occurs among banana flowers in Central America.

Given the extensive overlap in content, and considering the quotations above, the principal value of the system is presumably considered to lie in the molecular data. The molecular key is essentially similar to that developed by Moritz for the cd-rom "Pest Thrips of the World." However, because the molecular data are housed on a server at the University of Halle, Germany, in order to use the molecular key on this new cd-rom a buyer must first contact Moritz to obtain an access code. This constraint is not stated on the cd-

rom or its accompanying leaflet. However, this reviewer was soon provided with an appropriate code, and the speed was impressive with which data from Australia could be compared with molecular data on the Halle server, in a sophisticated system that Moritz has designed.

No information is available on the number of species for which molecular data are stored at Halle, but one of the quotations above indicates that the cd-rom provides gel images for all species in the key. In practice, the full suite of gels is provided for only 19 of the 91 species, with between 1 and 3 gel images for a further 29 species. Thus, for 43 species, no molecular data at all are provided, and this includes the highly invasive pest, *Scirtothrips dorsalis*, as well as many other well known pests. Curiously, in their remarks concerning the novelty and compass of their product, the authors do not mention the molecular data provided by Moritz for 45 species of Thripidae in "Pest Thrips of the World."

Given the range of interests within USDA, it is perhaps surprising that the information on "Pest Thrips of North America" is available only by purchase of the cd-rom from the publishers in Australia. In contrast, the morphology-based system "Thrips of California" is fully and freely web available (funded through the University of California with a grant scarcely 10% of that provided by USDA). One major advantage of web-availability is that new editions can be published easily, as was done in Jun 2009 for "Thrips of California" with the addition of more species and new images. "Pest Thrips of North America" is certainly a useful and impressive product, but it seems to fall short of the authors' aspirations and advertising.

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