Molecular barcodes for Philippine Bactrocera dorsalis and B. occipitalis (Diptera: Tephritidae): Insights on pest management through identification

Ronniel D Pedales, Joshua Philippe F Olorocisimo, Carla Francesca F Besa, Ace Kevin S Amarga, Ian Kendrick C Fontanilla

1Natural Sciences Research Institute, 2Institute of Biology, University of the Philippines—Diliman, 3Institute of Biological Sciences, University of the Philippines—Los Baños

BACKGROUND: The Bactrocera dorsalis complex (Diptera: Tephritidae) are widely known fly pest species of fruiting trees. While this group exhibits plastic morphologies and has a widespread distribution, the current taxonomy of the complex has been resolved through phylogenetics and cladistics. Application of this resolution, however, still needs to be translated to communities most affected by these pests. Molecular identification is a potential method for rapid identification as conventional taxonomy of the complex is difficult. This study aims to evaluate the barcoding genes COI, 16S, and 18S of B. dorsalis in the Philippines to determine a suitable marker for identification using the NCBI Genbank Database and molecular phylogenetics.

RESULTS: B. dorsalis and B. occipitalis were caught in methyl eugenol traps in localities spanning Luzon, Cebu Island, and Zamboanga. Represented samples (n=1) from each locality were subjected to DNA barcoding. The 18S rRNA gene did not show any sequence difference between the species while the 16S rRNA fragment was able to distinguish B. dorsalis from B. occipitalis through a single SNP. The COI gene was highly polymorphic; however, geographical clustering did not occur within species. BLAST results for the COI gene fragment were mostly inconclusive due to multiple species hits for the haplotypes. Phylogenetic analysis of the concatenated COI and 16S genes gave a more accurate species identification that was in concurrence with morphological analyses of the samples.

SIGNIFICANCE: The lack of local databases for pest species in the Philippines is a hindrance for the development of integrated pest management. Current updates in taxonomy of the B. dorsalis complex needs to be translated to the local farmers through a more efficient way of identification. Barcoding and phylogenetic analyses of the COI and 16S gene fragments have been found to effectively delineate species and should be explored for other tephritid pest taxa.

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$$\text{ACKNOWLEDGEMENTS}$$

$$\text{RESULTS}$$

1. Species identification of Philippine Bactrocera using the COI fragment in NCBI BLAST provides ambiguous and inaccurate results;
2. However, the COI gene alone is able to distinguish between the sympatric species B. dorsalis and B. occipitalis through comparisons of intra and inter-clade distances;
3. A barcoding threshold of 0.008 is recommended to delineate Philippine B. dorsalis from B. occipitalis;
4. This study follows the work of Schutze and colleagues’ on the B. dorsalis complex. The Philippines is encouraged to follow the former’s synonymy of Philippine Bactrocera for the management of its fruit fly pests.