## Morphological and molecular characterisation of the parasitoid complex of Liriomyza leafminer (Diptera: Agromyzidae) species in the small-scale vegetable production sector of Zimbabwe

Innocent Pahla, Jian Min Zhang, Robert Musundire & Doreen Zandile Moyo

## Abstract

The parasitoid complex of Liriomyza (Burgess) leafminers (Diptera: Agromyzidae) in small-scale horticultural production in Zimbabwe was investigated through morphometrics and molecular characterisation. The present study re-evaluated the discriminative ability of some traditional morphological characters, such as antennae, wing vernation, abdominal patterns, and thoracic microsetae. Additionally, electron micrographic methods for separating different species were conducted. Three DNAbased taxonomic identification methods, including MegaBLAST for identifying BLAST hits based on the amplified Cytochrome c oxidase I (COI) fragments using LCO1490-HCO2198 primers, sequence identification in barcode of life data system, and maximum likelihood phylogenetic analysis using RAxML 7.0.4 inferred from COI par sequence using a p-distance model were used. Morphological identification recovered six parasitoid biotypes (three Diglyphus, one Clostercerus, one Hemiptarsenus, and one Opius). Blasting of biotype COI sequences in the National Centre for Biotechnological Information database identified four of the sampled sequences as identical with other sequences of the world, whilst two did not match. Biotypes 2, 3, 6, and 5 were 94, 93, 96, and 95% identical to D. isea, D. isea, Hemiptarsenus varicornis, and the genus Opiinae. Analysis of genetic distances revealed an evolutionary divergence between biotype sequences and related known species using the CO1 gene. However, phylogenetic analysis revealed results that were not incongruent with morphology and blast results, possibly due to homoplasticity and species complexes in Hymenoptera. The present study revealed the occurrence of native parasitoids in Zimbabwe that can be used in designing programmed biocontrol of leafminers.