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An integrative approach for taxonomic characterization of *Aculus* spp. pests on stone fruits (*Prunus* spp.)

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Abstract: Eriophyids are among the most important pest mites worldwide. By considering the genus *Aculus*, the most economically important species on *Prunus* spp. are *Aculus fockeui* (Nalepa and Trouessart), on plum and several other stone fruits, and *A. cornutus* (Banks) on peaches. They cause symptoms such as chlorotic spots and curling of the young leaves, bronzing and rusting on the older leaves. Cryptic speciation is common in tiny and morphologically simple taxa such as the eriophyids and could also be expected in *Aculus* spp. To evaluate this, we applied an integrative approach to taxonomic characterization of pest species belonging to the genus *Aculus* on different stone fruit hosts. The results of phenotypic variability and COI mtDNA sequence analysis confirmed the present taxonomic status of the species *A. cornutus* and that *A. fockeui* represents a complex of cryptic species on different hosts.

Key words: *Aculus* spp., cryptic speciation, linear morphometry, COI mtDNA

Summary: Eriophyids are the second most economically significant group of phytophagous mites, after the Tetranychidae family. Cryptic speciation is common in taxa of small size and simplified structure, as is the case with eriophyids. Understanding cryptic speciation is important both for comprehension of speciation process and also for practical applications. Races or species, within a cryptic complex, may differ in characteristics such as impact on host plant physiology, invasion potential, capacity to damage agriculture and potential natural enemies. An integrative taxonomic approach, involving methods of morphological analysis supported by DNA sequence analysis, provides an understanding of cryptic speciation (Skoracka et al., 2015).

Among the genus *Aculus*, the most economically important species on *Prunus* spp. are *Aculus fockeui*, described on a plum (Nalepa and Trouessart, 1891) and registered on other stone fruits (Amrine et al., 1994), and *A. cornutus* (Banks, 1905), described on peaches, without clear morphological differences compared to *A. fockeui*. They cause symptoms such as chlorotic spots and curling of the young leaves, as well as bronzing and rusting on the older leaves. Very important losses occur in nurseries, where most mites are found (Boczek et al., 1984). It is assumed that a complex of cryptic species is to be expected among *Aculus* spp. The aim of this study is to clarify the taxonomic status of species belonging to the genus *Aculus*, which occur on different hosts of *Prunus* spp.

Populations of *Aculus* spp. have been collected from seven different host plants of *Prunus* species: plum (*P. domestica*), myrobalan plum (*P. cerasifera*), blackthorn (*P. spinosa*), sweet cherry (*P. avium*), sour cherry (*P. cerasus*), apricot (*P. armeniaca*) and peach (*P. persica*). For morphometric analysis, 23 morphological characters were measured on 30 protogynous females per sample. One-way multivariate analysis of variance (MANOVA) and canonical variance analysis (CVA) were applied on the measured characters' values. The barcode region of mitochondrial cytochrome c oxidase subunit I gene (COI) was amplified and directly sequenced using primers LCO1490Hem and HCO2198Hem (Germain et al., 2013) to draw phylogenetic tree.

The results of the linear morphometry showed clear difference among the four groups. The first CVA axis clearly distinguished the populations of peach, plum, myrobalan plum and blackthorn from the other populations; the second CVA axis made a clear distinction between the populations of sweet and sour cherry and apricot. The third CVA axis distinguished the populations of peach and the group of plum and myrobalan plum populations. Sequence analysis of COI mtDNA gene confirmed the results of linear morphometry. Within the populations of *Aculus* sp., four mitochondrial lineages corresponding to their host plants were clearly defined: one group consisted of populations collected on plum, myrobalan plum and blackthorn; another group consisted of populations inhabiting sweet and sour cherry, while two groups separated populations collected on apricot and peach.

Our results of morphometric and molecular analyses confirm the current taxonomic status of *A. cornutus* species while the *A. fockeui* populations, from the above-mentioned stone fruits, represent a complex of cryptic species.

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