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Identification of *Orius* spp. (Hemiptera: Anthocoridae) in vegetable crops using molecular techniques

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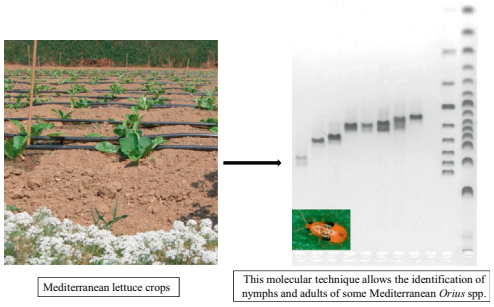
HIGHLIGHTS

- Immature stages of *Orius* spp. cannot be identified by morphological traits.
- Adults of *Orius* spp. can be morphologically identified only by their genitalia.
- This molecular method allows the discrimination of some Mediterranean *Orius* spp.
- *Orius laevigatus*, *O. majusculus* and *O. niger* were the most abundant in Spanish lettuce crops.

GRAPHICAL ABSTRACT



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ABSTRACT

The species of the genus *Orius* Wolff are well known as generalist predators able to control pest outbreaks in several agroecosystems. Correct species identification can be problematic given their similarities, particularly in the immature stage. A pair of primers previously designed from the internal transcribed spacer-1 (ITS-1) region was able to discriminate between seven *Orius* species commonly present in Mediterranean vegetable crops (*Orius majusculus*, *Orius laevigatus*, *Orius minutus*, *Orius laticollis*, *Orius horvathi*, *Orius albidipennis* and *Orius niger*), as well as to correctly identify *O. majusculus* and *O. laevigatus* from commercial colonies. This molecular tool was used for the discrimination of *Orius* spp. present in two lettuce crops, as well as in a *Lobularia maritima* flower margin in northeast Spain in 2009 and 2010. Molecular analyses revealed that *O. laevigatus*, *O. majusculus* and *O. niger* were the most common species present in both lettuce plots and the *L. maritima* border, although there was some variation depending on the plant and year. This molecular tool permits unambiguous identification of these species and allows proper implementation of biological control programs based on conservation.

1. Introduction

The genus *Orius* Wolff 1811 has 70 described species present in the Oriental, Ethiopian, Palaearctic, Neotropical and Nearctic regions, and the importance of this genus in efficient pest control is widely recognized (Horton, 2008). Several species are considered generalist predators that feed on a wide range of prey and are capable of very effective control of thrips (Riudavets and Castañé, 1998), as well as aphids, psyllids, scale insects, psocids, mites and the eggs of Lepidoptera, Coleoptera, and Diptera (Horton, 2008). They occur naturally in various agroecosystems including cotton, soybean, fava bean, potato, wheat, alfalfa, maize, and orchards (Veres et al., 2012). Seven *Orius* spp. have been reported to be present in vegetable crops of the Mediterranean basin: *Orius majusculus* (Reuter), *Orius laevigatus* (Fieber), *Orius albidipennis* (Reuter), *Orius niger* (Wolff), *Orius minutus* (L.), *Orius horvathi* (Reuter) and *Orius laticollis* (Reuter) (Ferragut and González-Zamora, 1994; Riudavets and Castañé, 1994; Tommasini, 2004). Like other heteropterans, some *Orius* spp. often show a lack of clear

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