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Lady beetles (Coleoptera: Coccinellidae) of Iranian cotton fields and surrounding grasslands

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ABSTRACT: Lady beetles (Coleoptera: Coccinellidae) are one of the powerful and dominant predators in cotton fields and also other agroecosystems. The fauna of these beneficial insects was studied in cotton fields and surrounding grasslands of Iran through 2000-2006. Totally, 40 species from 17 genera (including *Adalia, Anisosticta, Brumus, Chilocorus, Clitostethus, Coccinella, Cryptolaemus, Delphastus, Exochomus, Hippodamia, Nephaspis, Nephus, Oenopia, Propylea, Rodolia, Scymnus* and *Stethorus*) were collected from different regions of Iran.

KEY WORDS: Coccinellidae, cotton fields, fauna, Iran

INTRODUCTION

Cotton fields are one of the agroecosystems with interesting biodiversity (Alabama Cooperative Extension Service, 1999). Several insect pests, especially in orders Hemiptera, Coleoptera and Lepidoptera damge different parts of cotton plant all through the crop season and cause crop loss (Williams *et al*., 2000). There are diverse natural enemies (predators and parasitoids) in cotton fields which decrease the pests' population density and crop loss (Ghahari *et al*., 2008). One of these groups of beneficial insects which have efficient role in pest control in cotton fields all over the world, are lady beetles (Coleoptera: Coccinellidae) (Obrycki and Kring, 1998; Ghahari and Ostovan, 2006). Lady beetle fauna of cotton fields is very diverse in different regions of the world (Ellis and Bradley, 1992; Ellsworth *et al*., 1994).

Predaceous coccinellids are linked to biological control more often than any other taxa of predatory organisms. The beneficial status of these organisms has a rich history that is recognized by the general public and biological control practitioners alike (Hussey and Scopes, 1985; Dixon, 2000). The lady beetles are important natural enemies of pest species, especially whiteflies, aphids, mealybugs, scales and mites (Obrycki and Kring, 1998). The role of naturally occuring Coccinellidae in suppressing pest populations is significant but poorly doccumented in many pest management programs that purport to conserve natural enemies (Hodek and Honek, 1996). The causes for the relatively low rates of establishment of coccinellids in importation biological control have not been examined for most species (Cooper and Crenshaw, 1999). Augmentative releases of several coccinellid species are well documented and effective; however, ineffective species continue to be used due to ease of collection. For most agricultural systems, conservation techniques for Coccinellidae are lacking, even though they are abundant in these habitats. Evaluation techniques are available but quantitative assessment of the efficacy of coccinellids has not been done for most species in most agricultural crops. Greater emphasis is needed on evaluation of community–level interactions to maximize the use of coccinellids in biological control (Nechols *et al*., 1996; Obrycki and Kring, 1998).

Although many studies have been conducted on Iranian Coccinellidae (Modarres Awal, 1997), the fauna of these beneficial and important insects in biological control and IPM programs studied in recent years. The lone work on the coccinellid fauna of Iranian cotton fieldswas conducted by Ghahari and Ostovan (2006) in Mazandaran and Golestan Provinces. İn the present paper, the fauna of Coccinellidae from most Iranian cotton fields is discussed.

MATERIALS AND METHODS

Faunistic surveys on Coccinellidae of Iranian cotton fields were carried out in , major cotton growing regions in Iran. Totally 8 provinces including Golestan, Mazandaran, Tehran, Semnan, Fars, Khorasan, East Azarbayjan and Ardabil, and 21 localities including, Kordkoy, Nokandeh, Salikandeh, Gorgan, Gonbad, Ali-Abad, Azadshahr, Ramian, Aghghala, Minoodasht, Bandar-Torkman of Golestan province, Ghaemshahr, Sari, Neka, Behshahr, Galogah of Mazandaran province, Varamin of Tehran province, Garmsar of Semnan province, Darab of Fars province, Kashmar of Khorasan province, Arasbaran of East Azarbayjan province, and Dashte-Moghan of Ardabil province were sampled. The materials were collected mainly by a sweepnet and aspirator. The lady birds were collected from the cotton fields and surrounding grasslands for seven crop seasons (2000–2006). In addition to the collected specimens by the authors, several other collected specimens by many researchers and amateur students were and insect collections of some universities including, Ardabil, Damghan, Ghaemshahr, Shahre Rey and Varamin Islamic Azad Universities, Tehran and Fars Science & Research Branches were used for this research. The information concerning specific name, authority, locality and date of collection, and number of species (in brackets) is given for the species studied.. In this paper, classification and nomenclature suggested by Majerus & Kerans (1989) and Majerus (1994) have been followed.

RESULTS AND DISCUSSION

In all, 40 lady beetle species from 17 genera were collected from Iranian cotton fields and surrounding grasslands. The list of species is given below.

***Adalia bipunctata* (L.)**

Material: Mazandaran province: Ghaemshahr (2), May 2000; Behshahr (1), August 2000. Golestan province: Gorgan (1), June 2001; Gonbad (4), September 2001; Ali–Abad (2), August 2002; Ramian (1), September 2002. Fars province: Darab (3), July 2003. Khorasan province: Kashmar (2), October 2004. Tehran province: Varamin (4), July 2005. Ardabil province: Dashte–Moghan (2), September 2005.

***Adalia decempunctata* (L.)**

Material: Mazandaran province: Neka (1), April 2001. Fars province: Darab (3), June 2002. Khorasan province: Kashmar (1), October 2004. Golestan province: Gonbad (2), July 2003.

***Anisostica bitriangularis* Say**

Material: Semnan province: Garmsar (1), August 2004. Golestan province: Azadshahr (1), September 2005.

***Brumus octostignatus* Gebler**

Material: Khorasan province: Kashmar (1), October 2002. Golestan province: Ali–Abad (2), July 2005.

***Brumus undecempunctata* L.**

Material: Golestan province: Kordkoy, Nokandeh (3), August 2003; Galogah (1), October 2003.

***Chilocorus bipustulatus* (L.)**

Material: Mazandaran province: Ghaemshahr, Sari (6), April 2000; Neka, Behshahr (5), August 2000. Golestan province: Gonbad (4), September 2001; Nokandeh (2), June 2002; Ramian (3), September 2002; Gorgan (2), July 2003. Khorasan province: Kashmar (4), October 2002. Ardabil province: Dashte-Moghan (2), September 2003. Tehran province: Varamin (2), August 2004. Semnan province: Garmsar (1), July 2004. Fars province: Darab (5), August 2005.

***Chilocorus stigma* Say**

Material: Mazandaran province: Sari (1), August 2006.

***Clitostethus arcuatus* (Rossi)**

Material: Golestan province: Gorgan, Minoodasht (2), September 2001; Kordkoy (1), August 2003. Mazandaran province: Behshahr, Galogah (3), June 2005.

***Coccinella hieroglyphica* (L.)**

Material: Mazandaran province: Behshahr (2), August 2004.

***Coccinella monticola* Mulsant**

Material: Golestan province: Kordkoy, Gorgan (2), July 2003.

***Coccinella septempunctata* L.**

Material: Mazandaran province: Ghaemshahr, Sari (11), April 2000; Neka (8), August 2000; Behshahr, Galogah (4), September 2000. Golestan province: Gonbad (7), September 2001; Nokandeh (2), June 2002; Ramian, Aghghala (5), September 2002; Gorgan (3), July 2003; Salikandeh (1), September 2003; Kordkoy (6), October 2003. Khorasan province: Kashmar (7), October 2002. Ardabil province: Dashte-Moghan (6), September 2003. Tehran province: Varamin (16), August 2004. Semnan province: Garmsar (3), July 2004. Fars province: Darab (14), August 2005. East Azarbayjan province: Arasbaran (6), Septmber 2005.

***Coccinella trifasciata subversa* Le Conte**

Material: Khorasan province: Kashmar (1), October 2004.

***Coccinella undecimpunctata* L.**

Material: Mazandaran province: Behshahr (1), April 2001. Golestan province: Gonbad, Ali-Abad (2), July 2003. Fars province: Darab (2), September 2004. Tehran province: Varamin (1), August 2005. Semnan province: Garmsar (1), April 2006.

***Cryptolaemus montrouzieri* Mulsant**

Material: Mazandaran province: Neka, Behshahr (2), September 2002.

***Delphastus pusillus* (LeConte)**

Material: Ardabil province: Dashte-Moghan (2), September 2003. Khorasan province: Kashmar (1), October 2004. Golestan province: Salikandeh, Nokandeh (1), August 2005. Mazandaran province: Behshahr (1), April 2006; Ghaemshahr, Sari (3), September 2006.

***Exochomus flavipes* (Thunb.)**

Material: Mazandaran province: Neka (2), April 2000; Behshahr, Galogah (3), September 2000; Sari (1), October 2000. Golestan province: Aghghala, Bandar-Torkman (4), August 2000; Gonbad (1), September 2001; Nokandeh (1), June 2002; Ramian (2), September 2002; Gorgan (1), July 2003; Salikandeh (2), September 2003; Kordkoy (2), October 2003. Khorasan province: Kashmar (2), October 2002. Ardabil: Dashte-Moghan (3), September 2003. Tehran province: Varamin (1), August 2004. Semnan province: Garmsar (1), July 2004. Fars province: Darab (5), August 2005. East Azarbayjan province: Arasbaran (2), Septmber 2005.

***Exochomus nigromaculatus* (Goeze)**

Material: Khorasan province: Kashmar (3), October 2002. Semnan province: Garmsar (1), August 2006.

***Exochomus nigripennis* (Erichson)**

Material: Fars province: Darab (2), June 2005.

***Exochomus pubescens* Kuster**

Material: Mazandaran province: Sari, Behshahr (3), August 2000; Ghaemshahr (1) September 2000. Golestan province: Gorgan (1), September 2001; Nokandeh, Aghghala (2), June 2002; Ramian (1), September 2002; Salikandeh (1), September 2003; Kordkoy, Bandar-Torkman (3), October 2003. Khorasan province: Kashmar (2), October 2002. Ardabil province: Dashte-Moghan (2), September 2003. Tehran province: Varamin (3), August 2004. Fars province: Darab (3), August 2005.

***Exochomus quadripustulatus* (L.)**

Material: Golestan province: Gonbad (3), July 2003. Khorasan province: Kashmar (1), October 2004. Mazandaran province: Ghaemshahr (2), April 2006. Semnan province: Garmsar (2), July 2006.

***Hippodamia convergens* Guérin-Méneville**

Material: Fars province: Darab (1), July 2004. Mazandaran province: Behshahr (1), September 2004.

***Hippodamia variegata* (Goeze)**

Material: Mazandaran province: Ghaemshahr, Sari (2), April 2000; Galogah (1), June 2006. Khorasan province: Kashmar (2), October 2002. Golestan province: Azadshahr (1), July 2003; Ali-Abad, Minoodasht (3), September 2004. Semnan province: Garmsar (2), August 2005.

***Nephaspis oculatus* (Blatchley)**

Material: Tehran province: Varamin (1), August 2005. Mazandaran province: Sari (1), June 2005. Golestan province: Gorgan (1), September 2006.

***Nephus biguttatus* Mulsant**

Material: Semnan province: Garmsar (2), August 2002. Tehran province: Varamin (1), September 2002. Fars province: Darab (1), June 2003.

***Nephus bipunctatus* (Kugelann)**

Material: Mazandaran province: Behshahr (1), June 2005.

***Oenopia conglobata* (L.)**

Material: Fars province: Darab (2), September 2003.

***Oenopia conglobata contaminata* Menetries**

Material: Mazandaran province: Behshahr, Galogah (3), August 2005.

***Propylea quatuordecimpunctata* (L.)**

Material: Golestan province: Gorgan, Kordkoy (2), July 2001. Mazandaran province: Neka (1), September 2005.

***Rodolia fausti* Weise**

Material: Golestan province: Gonbad (1), September 2004.

***Scymnus apetzi* Mulsant**

Material: Semnan province: Garmsar (1), October 2001. Khorasan province: Kashmar (1), October 2002.

***Scymnus araricus* Khnzorian**

Material: East Azarbayjan province: Arasbaran (2), Septmber 2005.

***Scymnus flavicollis* (Redtenbacher)**

Material: Mazandaran province: Ghaemshahr (1), April 2001. Golestan province: Gonbad (1), August 2003.

***Scymnus frontalis* (Fabricius)**

Material: Fars province: Darab (2), September 2003. Khorasan province: Kashmar (1), October 2004.

***Scymnus levaillanti* Mulsant**

Material: Khorasan province: Kashmar (1), October 2004.

***Scymnus pallipes* (Mulsant)**

Material: Ardabil province: Dashte-Moghan (1), September 2004.

***Scymnus subvillosus* (Goeze)**

Material: East Azarbayjan province: Arasbaran (3), Septmber 2005.

***Scymnus syriacus* (Marseul)**

Material: Mazandaran province: Behshahr (2), September 2004. East Azarbayjan province: Arasbaran (1), Septmber 2005.

***Stethorus gilvifrons* (Mulsant)**

Material: Mazandaran province: Neka (1), August 2001. Golestan province: Ramian, Azadshahr (2), July 2003.

***Stethorus nigripens* Kapur**

Material: Golestan province: Bandar-Torkman, Minoodasht (3), August 2003. Khorasan province: Kashmar (1), October 2004.

***Stethorus punctillum* Weise**

Material: Ardabil province: Dashte-Moghan (1), September 2002. Mazandaran province: Behshahr, Sari (2), August 2004.

The results of this research indicte that there is a diverse fauna of Coccinellidae in the cotton fields of Iran. Of the collected species, 5 species including *Adalia bipunctata*, *Chilocorus bipustulatus*, *Coccinella septempunctata*, *Exochomus flavipes*, and *Exochomus pubescens* are the most common and abundant species in nearly all the Iranian cotton fields. The three genera *Scymnus, Exochomus* and *Coccinella* with 8, 6, and 5 species, respectively, are more diverse than others in Iranian cotton fields.

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