A faunistic survey on some families of Coleoptera from cotton fields of northern Iran

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Abstract: This paper deals with a preliminary faunistic study on 15 families of Coleoptera occurring in some cotton fields in the northern parts of Iran. The families represented are as follows: Alleculidae, Anthicidae, Bruchidae, Cantharidae, Chrysomelidae, Cleridae, Elateridae, Malachiidae, Meloidae, Nitidulidae, Oedemeridae, Silphidae, Spercheidae, Staphylinidae and Thanerocleridae. A total of 48 common species were collected from the cotton fields and surrounding grasslands.

Key words: Coleoptera, fauna, cotton fields, Iran

Introduction

Cotton fields are one of the agroecosystems with interesting biodiversity (Alabama Cooperative Extension Service, 1999). Cotton production plays an important role in the economic development of many countries, and any crises that decrease the production of this commodity can adversely affect these countries. In almost all cotton-producing countries of the world, insect pests and crop diseases are considered the major factors that contribute to a decrease in cotton production (Luttrell *et al.*, 1994; Wu & Guo, 2005). Several insect pests, especially in orders Hemiptera, Coleoptera and Lepidoptera damage different parts of cotton plant all through the crop season and cause crop loss (Williams *et al*., 2000).

The major pest complexes infesting the cotton crop at various growth stages in almost regions of the world such as Iran include the cotton bollworm (*Helicoverpa armigera*), aphids (*Aphis gossypii* and *Aphis* spp.), the pink bollworm (*Pectinophora gossypiella*), spider mites (*Tetranychus urticae, T. turkestani*), a complex of thrips (*Thrips tabaci*), mirids (*Adelphocoris lineolatus, Lygus lucorum*, and *L. pratensis*), whiteflies (*Bemisia argentifolii* and *B. tabaci)*, the beet armyworm (*Spodoptera exigua*), the spiny bollworms (*Earias insulana*), and leafhoppers (*Empoasca* spp.)(Anonymous, 1980). Temporal changes in the arthropod complex are common within all regions, but the above are the most common pest species (Sun & Chen, 1999; Wu & Guo, 2005). As a result of several conducted samplings and researches in Iranian cotton fields by different researchers, there is now evidence that a very diverse fauna comprising various groups of insects, inhabit such cotton fields.

There are more known species of Coleoptera than any other group of organisms, with over 350,000 described species (Fisher, 1988; Watt, 1997). Among the different coleopteran families of Iranian cotton fields, only three families (viz. Carabidae, Coccinellidae and Curculionidae) have been studied rather well (Ghahari *et al*. 2009a, b, 2011). The aim of this paper was to determine the biodiversity of some coleopteran families (excluding the above-mentioned three families of Coleoptera) in the cotton fields of northern Iran.

Materials and Methods

Specimens were collected by sweeping, aspirator, beating tray, canopy fogging, leaf litter sifting (and by processing the samples through Berleise funnels), malaise and flight intercept traps and of course hand collecting by locating suitable hosts and searching for beetles. In addition to the cotton fields, the surrounding grasslands were sampled for coleopteran specimens (Figs. 1, 2). The sampled regions were Pars-Abad (Ardabil province), Arasbaran (East Azarbaijan province), Ali-Abad, Gonbad, Gorgan, Kordkoy, Nokandeh, Salikandeh (Golestan province), Kashmar (Khorasan), Behshahr, Galogah, Neka (Mazandaran province), Garmsar (Semnan province). The information concerning the species' name, describer, locality, date of collection, and the number of specimens (in brackets) are also given. The materials are deposited in the collection of the second author.

Species list

Family Alleculidae Laporte, 1840

Omophlus (Omophlus) caucasicus (Kirsch, 1869)
Material: East Azarbaijan province: Arasbaran, (1), unknown date.

Omophlus (Omophlus) pilicollus (Ménétriès, 1832)
Material: Material: Golestan province: Nokandeh, (4), October 2008. Golestan province: Gorgan, (3), Spring 2009.

Family Anthicidae Latreille, 1819

Anthicus crinitulus (Pic, 1901)
Material: Golestan province: Nokandeh, (2), October 2008. Mazandaran province: Behshahr, (1), June 2009.

Anthicus steppensis Marseul, 1879
Material: Mazandaran province: Galogah, (1), April 2010.

Cyclodinus debilis (LaFerte-Senectere, 1849)
Material: Golestan province: Salikandeh, (2), October 2008.

Cyclodinus villosulus (Truqui, 1855)
Material: East Azarbaijan province: Arasbaran, (1), July 2009.

Omonadus bifasciatus (Rossi, 1794)
Material: Golestan province: Ali-Abad, (3), May 2009.

Fig. 1. Sweeping by the first author in order to collect coleopteran specimens within the surrounding grasslands of cotton fields, Mazandaran province (northern Iran).

Family Bruchidae Latreille, 1802

Bruchus incurvatus Motschulsky, 1873
Material: Mazandaran province: Neka, (3), May 2008.

Bruchidius poecilus (Germar, 1824)
Material: Golestan province: Gonbad, (6), June 2007.

Family Cantharidae Imhoff, 1856

Cantharis livida Linnaeus, 1758
Material: Golestan province: Nokandeh, (2), October 2008. East Azarbaijan province: Arasbaran, (1), July 2009. Golestan province: Gonbad, (5), April 2010.

Family Chrysomelidae Latreille, 1802

Chryscochares puctatus (Gebler, 1845)
Material: Khorasan province: Kashmar, (1), October 2009.

Chrysolina chalcites (Germar, 1824)
Material: Golestan province: Gorgan, (2), June 2009.

Prasocuris junci (Brahm, 1790)
Material: Ardabil province: Pars-Abad, (1), Summer 2008.

Family Cleridae Latreille, 1802

Tillodenops plagiatus (Fairmaire, 1892)
Material: Golestan province: Ali-Abad, (3), May 2009. Khorasan province: Kashmar, (1), Unknown date.

Trichodes sipylus (Linnaeus, 1758)
Material: Mazandaran province: Behshahr, (4), August 2009.

Fig. 2. Hand collecting of coleopteran specimens by the first author within the surrounding grasslands of cotton fields, Golestan province (northern Iran).

Trichodes nobilis Klug, 1842
Material: Khorasan province: Kashmar, (2), October 2009.

Trichodes laminatus Chevrolat, 1843
Material: Golestan province: Gonbad, (2), June 2007.

Family Elateridae Leach, 1815

Calais parreyssi (Steven, 1830)
Material: Golestan province: Salikandeh, (5), Unknown date.

Cardiophorus rotundicollis Frivaldszky, 1845
Material: East Azarbaijan province: Arasbaran, (3), Summer 2008.

Hemicrepidius hirtus (Herbst, 1784)
Material: Ardabil province: Pars-Abad, (4), Summer 2008.

Melanotus tenebrosus (Erichson, 1841)
Material: Golestan province: Gorgan, (3), June 2009.

Family Malachiidae Leach, 1817

Malachius (Malachius) ephippiger Redtenbacher, 1843
Material: Ardabil province: Pars-Abad, (2), Unknown date.

Malachius (Malachius) heliophilus Peyron, 1877
Material: Semnan province: Garmsar, (3), November 2008.

Malachius (Malachius) pulcherrimus (Pic, 1909)
Material: East Azarbaijan province: Arasbaran, (3), Summer 2008.

Malachius (Malachius) vittatus Ménétriès, 1832
Material: Golestan province: Nokandeh, (2), October 2008. Khorasan: Kashmar, (4), October 2009.

Family Meloidae Gyllenhal, 1810

Alosimus syriacus rauterbergi (Reitter, 1907)
Material: East Azarbaijan province: Arasbaran, (3), Summer 2008.

Apalus necydaleus (Pallas, 1782)
Material: Mazandaran province: Behshahr, (2), September 2010.

Zonitis (Zonitis) flava Fabricius, 1775
Material: Golestan province: Gorgan, (1), Autumn 2009.

Family Nitidulidae Latreille, 1802

Meligethes brunnicornis Sturm, 1845
Material: Golestan province: Gonbad, (2), June 2007. Mazandaran province: Behshahr, (1), Autumn 2009.

Meligethes pectinatus Schilsky, 1894
Material: Ardabil province: Pars-Abad, (3), Summer 2008.

Brachypterolus pulicarius (Linnaeus, 1758)
Material: Golestan province: Salikandeh, (1), October 2008.

Brachyleptus quadratus (Sturm, 1844)
Material: Semnan province: Garmsar, (2), October 2010.

Family Oedemeridae Latreille, 1810

Oedemera lurida (Marscham, 1802)
Material: Mazandaran province: Behshahr, (6), August 2005. East Azarbaijan province: Arasbaran, (3), July 2009. Golestan province: Kordkoy, (4), Unknown date.

Family Silphidae Latreille, 1807

Blitophaga (Blitophaga) opaca (Linnaeus, 1758)
Material: Golestan province: Nokandeh, (3), October 2008.

Nicrophorus vespillo (Linnaeus, 1758)
Material: Mazandaran province: Neka, (2), July 2007. Ardabil province: Pars-Abad, (3), September 2009.

*Nicrophorus vespilloide*s Herbst, 1783
Material: East Azarbaijan province: Arasbaran, (1), Summer 2008.

Family Spercheidae Erichson, 1837

Spercheus emarginatus (Schaller, 1783)
Material: Golestan province: Ali-Abad, (2), May 2009.

Family Staphylinidae Lameere, 1900

Brachygluta xanthoptera (Reichenbach, 1816)
Material: East Azarbaijan province: Arasbaran, (4), Summer 2008.

Claviger katharinae Escherich, 1897
Material: Mazandaran province: Behshahr, (3), Autumn 2009.

Euplectus sanguineus Denny, 1825
Material: Golestan province: Salikandeh, (2), October 2008.

Lobrathium rugipenne (Hochhuth, 1851)
Material: Mazandaran province: Galogah, (1), April 2007.

Myrmecopora uvida (Erichson, 1840)
Material: East Azarbaijan province: Arasbaran, (3), August 2010.

*Omalium oxyacantha*e Gravenhorst, 1806
Material: Golestan province: Gonbad, (2), June 2007.

Philonthus velatipennis Solsky, 1869
Material: Semnan province: Garmsar, (1), October 2010.

Platyprosopus hierochonticus Reiche & Saulcy, 1856
Material: Golestan province: Kordkoy, (3), July 2010.

Quedius vicinus (Menetries, 1832).
Material: Mazandaran province: Galogah, (1), Spring 2006.

Trichophya pilicornis (Gyllenhall, 1810)
Material: Golestan province: Gorgan, (1), May 2010.

Family Thanerocleridae Kolibac, 1992

Thaneroclerus buqueti Lefebvre, 1835
Material: Mazandaran province: Behshahr, (2), unknown date.

Discussion

This paier records a total of 48 Coleoptera species were collected from cotton fields and surrounding grasslands of different areas located especially in northern Iran. Some of the species are agricultural pests, some are biological control agents and some others such as Silphidae have an important role in the survival of food chains of ecosystems.

Pest management in cotton requires frequent, labour-intensive, sampling of different age classes of fruit and several species of arthropods. A single, robust, statistical model of dispersion is needed if a simple and efficient program of sampling all appropriate plant parts and arthropods at each site is to be devised (Wilson *et al*., 1983). There are two approaches to the utilization of natural enemies of insect pests in an agricultural system:

preservation and augmentation of existing predators and parasites, and mass rearing of natural enemies for release to regulate the population density of the target insect pest. Preservation and augmentation of existing predators and parasites in cotton by means of rational application of insecticides and crop habitat manipulation can effectively decrease population density of major pests especially whiteflies, aphids and cotton bollworms (Xing *et al*., 1991; DeBach & Rosen, 1991). Another practice to increase the impact of natural enemies is to use selective pesticides instead of broad-spectrum insecticides. After testing biological control of pests, more researchers understand that it is very difficult to effectively control pests solely with natural enemies and biocontrol agents, especially during the season when cotton bollworm poses a serious threat. Instead, biological control should be one of the important components of Integrated Pest Management (IPM) (Zhang *et al.*, 1997; Wu & Guo, 2005; Ghahari *et al*., 2008).

The integrated pest management concept has gradually gained acceptance and has been adopted over the past three decades as an eco-friendly pest management approach suitable for sustained production of a commodity. IPM practices in agriculture can be defined as an optimum combination of pest management methods implemented in farmers' fields that minimizes economic yield loss of a crop caused by insect pests without resulting in toxic effects to other organisms (Flint & Dreistadt, 1998; Maredia *et al*., 2003). IPM practices in cotton have been developed in various ways in many countries of the world, but these practices vary with the socioeconomic and environmental characteristics of each country. Research on insect management of cotton has resulted in the development of viable IPM technologies for the production of cotton, especially in the United States, Australia, Brazil, and Russia (Luttrell *et al.*, 1994; Bellows & Fischer, 1999; Wu & Guo, 2005). Although the main method for cotton pest control in Iran is by the chemical method, all researchers must try to encourage farmers to apply safe control methods, especially biological control. The destructive effects of pesticides on human health are evident for all people, but there are many known and unknown agents which affect the decisions of farmers for choosing optimum control methods.

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References

Alabama Cooperative Extension Service. (1999). *Cotton insect, disease, nematode, and weed control recommendations for 1999.* Alabama Cooperative Extension Service publication 99IPM-415.

Anonymous. (1980). *Cotton insect pests and their natural enemies.* Wuhan, China: Hubei People's Press.

Bellows, T.S. & Fischer, T.W. (1999). *Handbook of biological control*. Academic Press, San Diego, CA. 1046 pp.

DeBach, P. & Rosen, D. (1991). *Biological control by natural enemies.* 2nd ed. Cambridge University Press, New York, 440 pp.

Flint, M.L. & Dreistadt, S.H. (1998). *Natural enemies handbook – the illustrated guide to biological control.* University of California Press, Berkeley, CA. 154 pp.

Ghahari, H., Hayat, R., Tabari, M., Ostovan, H. & Imani, S. (2008). A contribution to the predator and parasitoid fauna of rice pests in Iran, and a discussion on the biodiversity and IPM in rice fields. *Linzer Biologische Beiträge*, 40/1: 735-764.

Ghahari, H., Kesdek, M., Samin, N., Ostovan, H., Havaskary, M. & Imani, S. (2009a). Ground beetles (Coleoptera: Carabidae) of Iranian cotton fields and surrounding grasslands. *Munis Entomology & Zoology*, 4(2): 436-450.

Ghahari, H., Jedryczkowsky, W.B., Aslan, M. & Ostovan, H. (2009b). Lady beetles (Coleoptera: Coccinellidae) of Iranian cotton fields and surrounding grasslands. *Journal of Biological Control*, 23(3): 265-269.

Ghahari, H., Legalov, A.A. & Arzanov, Y.G. (2011). A contribution to the biodiversity of weevils (Coleoptera: Curculionidae) in Iranian cotton fields and surrounding grasslands. *Linzer Biologische Beiträge*, 43/2: 1237-1245.

Klimaszewski, J. & Watt, J.C. (1997). *Coleoptera: family-group review and keys to identification.* Manaaki Whenua Press, 199 pp.

Luttrell, R.G., Fitt, G.P., Ramalho, F.S. & Sugonyaev, E.S. (1994). Cotton pest management: part 1. A worldwide perspective. *Annual Review of Entomology*, 39: 517-26.

Maredia, K.M., Dakouo, D. & Mota-Sanchez, D. (2003). *Integrated pest management in the global arena.* Cromwell Press, Trowbridge, U.K. 512 pp.

Sun, J. & Chen, B. (1999). *Cotton.* Beijing: Agricultural Press, 245 pp.

Xing, J., Feng, S., Fan, X., Li, B. & Feng, S. (1991). The application of Bt emulsion against cotton bollworm and its preserving effect for natural enemies to suppress summer cotton aphid. *Acta Phytophylacica Sinica*, 18: 207-10.

Williams, M.R., Dugger, P. & Richter, D. (2000). *Cotton insect loss estimates. 1999-2000.* Proceedings Beltwide Cotton Conferences, San Antonio, Texas. Volume 2, pp. 884-913.

Wilson, L.T., Room, P.M. & Bourne, A.S. (1983). Dispersion of arthropods, flower buds and fruit in cotton fields of population density and season on the fit of probability distributions. *Journal of the Australian Entomological Society*, 22: 129-134.

Wu, K.M. & Guo, Y.Y. (2005). The evolution of cotton pest management practices in China. *Annual Review of Entomology*, 50: 31-52.

Zhang, G., Zhang, Z., Sun, X., Jiang, Q. & Zhang, C. (1996). Evaluation of applicable effectiveness of new formulation of *Helicoverpa* NPV insecticide-emulsifiable suspension. *Chinese Journal of Biological Control*, 12: 24-28.

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