



SURVEY OF THE INSECT PESTS FROM SOME ORCHARDS IN THE MIDDLE OF IRAQ

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Abstract

This study designed at identifying insect pests that attack some trees and shrubs grown in the orchards in different regions, middle of Iraq. The investigation included date palm, citrus, pomegranate trees and grape shrubs. During the survey, 10 species were recorded on date palms (the most infested was *Ommatissus lybicus* de Bergevin, 1930, followed by *Oryctes elegans* Prell, 1914), four species on citrus (the most infested was *Aonidiella orientalis* (Newstead, 1894) followed by whitefly *Trialeurodes vaporariorum* (Westwood, 1856), one species only on pomegranate (*Aphis punicae* Passerini, 1863), and one species *Arboridia hussaini* (Ghauri, 1963) on Grapes. Given the importance of date palm trees in Iraq, the most important insect pests present and recorded in previous studies have been summarized. Also, the synonyms of the species and their geographical distribution are provided.

Keywords: Iraq, Orchards, Pests, Shrubs, Survey, Trees.

Introduction

The orchards in the middle of Iraq are one of the most important by farmers due to the important crops they offer in the local market, such as dates, citrus fruits, pomegranate, apples, apricots, etc. However, these crops have been facing numerous problems, including the infection by various pests; especially, the insects.

Date palms are one, of the most important fruit trees that receive great farmer attention from, but the cultivating not easy, they attacked by different insect pests; from these insects which classify as important pests on palms because of their wide distribution and the seriousness of economic harm they can cause to different parts and stages of palms : dubas bug, the lesser date palm moth, the long horn stem borer, Bunch borer, frond borers, Arabian rhinoceros beetle (Abdel-Hussian, 1985; El-Haideri and Al-Hafeedh, 1986; Khalaf *et al.*, 2013).

On citrus trees; the citrus trees can infection by many pests belonging to various insect orders are associated with flowers, shoots and roots; Futch (2011) stated many pests on citrus trees: leaf miners (Gracillariidae), mealybug, swallowtail butterfly, scale insects, whitefly and fruit fly. On the other hand, there are many pest on pomegranate for example: *Deudorix isocrates* Fabricus (Lepidoptera: Lycaenidae), stem borer *Coelosterna spinator* Fabricius (Coleoptera: Cerambycidae), whitefly *Siphoninus phillyreae* Haliday (Hemiptera: Aleyrodidae), shot hole borer *Xyleborus perforans* Wollastan (Coleoptera: Scolytidae), Thrips *Scirtothrips dorsalis* hood (Thysanoptera: Thripidae), and fruit borer *Conogethes punctiferalis* (Guenee) (Lepidoptera: Pyralidae) (Satyagopal *et al.*, 2014).

The aim of this investigation, survey of insect pests infested tree orchards, and identifies the most prevalent species; also, provide a list of insect pests of date palms that registered previously in Iraq.

Materials and Methods

In this survey were collected many specimens of insects from orchards of the middle of Iraq, which planted with the following trees: date- palms, different species of citrus,

pomegranates, figs and grapes randomly during the period from 1st.March to 1st.November.2019. There are many tools used to collect the specimens that including: nets, aspirators, light traps, and also by direct method using the forceps.

For identification insects used different Taxonomical Keys such as: Martin *et al.* (2000), Muniappan *et al.* (2012), Al Antary *et al.* (2014), Krell and Král (2017) and Ramos and Caballero (2017) and Muzaffarian (2018). The synonyms of species according to GBIF Secretariat (2019).

Results and Discussion

During the current investigation, there were collected 16 species belonging to 14 genera and 14 families under 4 orders from orchards from different localities of middle of Iraq; these species are listed below:

(1) Insects of date palm trees:

Order, Coleoptera

Family, Bostrichidae

Phonapate frontalis (Fähræus, 1871)

Common name: Date palm frond borer

Materials examined (11 specimens): Wasit province, Al-Numaniyah, 8♀♀, 3.v.2019; 3 ♀♀, 20.ix.2019.

Distribution: Iraq (Hussain, 1963); Israel (Blumberg, 2008); Jordon (Al-Antary *et al.*, 2014); Saudi Arabia, Yemen, Algeria and Oman (Al-Haideri and Al -Hafith, 1986); Libya (Atia *et al.*, 2009).

Family, Dynastidae

Oryctes agamemnon Burmeister, 1847

Common name: Rhinoceros beetle

Materials examined (10 specimens): Karbala province, Karbala, 5♂♂ and Al-Hindiya District, 5♀♀, 20.ix.2019.

Distribution: Iraq (Abdul-Rassoul, 1976); Oman (Al-Sayed and Al-Tamiemi, 1999); Tunisia (Ehsine *et al.*, 2009); Saudi-Arabia (Ibrahim and Alahmad, 2015).

Oryctes elegans Prell, 1914

Synonyms:

Oryctes piesbergeni Bodemeyer, 1916

Oryctes siniacus Petrovitz, 1957

Common names: Fruit stalk borer, bunch stalk borer.

Materials examined (44 specimens): Baghdad, Jaddria, 6♂♂; 4.iii.2019; Wasit, Al-Numaniyah, 8♀♀, 23.vi.2019; Al-Najaf, Najaf district, 9♂♂, 4.ix.2019; Karbala, Karbala district, 10♀♀, 7.x.2019; Babylon, Musayyib district, 11♀♀, 20.x.2019.

Distribution: Iraq (Abdul-Rassoul,1976); Qatar (Al-Azawi,1986); Iran (Kerll, 2006); Saudi Arabia (Al-Deghairi, 2007); UAE (Krell and Král, 2017); Bahrain (Abded Karim *et al.*, 2016).

Oryctes sahariensis De Miré, 1960

Materials examined (10 specimens): Al-Najaf, Najaf, 6♂♂, 4♀♀, 5.ix.2019.

Distribution: Iraq (Al-Saeedi, 2015); Egypt (Carpenter, 1975); Chad and Sudan (Carpenter and Elmer, 1978); Qatar (Mokhtar, 2009).

Family, Cerambycidae

Jebusaea hammerschmidtii Reiche, 1878

Synonyms:

Bagdatocerambyx drurei Pic, 1901

Jebusaea hammerschmidtii Aurivillius, 1912

Jebusaea persica Fuchs, 1956

Jebusaea persica Reitter, 1907

Jebusaea persica Villiers, 1967

Pseudophilus testaceus Gahan, 1893

Common name: Long- horn Date-palm Stem borer.

Materials examined (13 specimens): Wasit, Al-Numaniyah, 7♂♂, 6♀♀, 24.v.2019

Distribution: Iraq (Derwesh, 1965); Qatar (Al-Azawi, 1986); Palestine, Iran (GBIF Secretariat, 2019).

Family, Curculionidae

Coccotrypes dactyliperda (Fabricius, 1801)

Synonyms:

Bostrichus dactyliperda Fabricius, 1801

Coccotrypes bassiavorus Hopkins, 1915

Coccotrypes borassi Beeson, 1939

Coccotrypes eggersi Hagedorn, 1904

Coccotrypes elaeocarpi Beeson, 1939

Common names: Date stone beetle, palm seed borer

Distribution: Iraq (Bureau of Entomology and Plant Quarantine, 1950); Iran (Shafiean, 2017); Morocco (Ait-Oubahou and Yahia, 1999); Jordan (Mashal and Albeidat,

2006); Oman (Elwan, 2000); Saudi Arabia (Al Dhafer and Alayeid, 2014); Egypt (El-Sherif *et al.*, 1998).

Order, Lepidoptera

Family, Batrachedridae

Batrachedra amydraula Meyrick, 1916

Common name: Lesser Date Moth

Distribution: This species reported in Iraq by Wiltshire (1957) under the family Momphidae; Israel (Blumberg,1975); Oman (Elwan, 2000); Egypt (Harhash *et al.*, 2003); Iran (Latifian *et al.*, 2004); Khuzestan (Latifian and Nejadian, 2009); India (Haldhar *et al.*, 2017); Pakistan (Jatoi *et al.*, 2020).

Family, Pyralidae

Aphomia sabella (Hampson, 1901)

Synonym: *Arenipses sabella* Hampson, 1901

Common name: Greater Date Moth.

Distribution: This species reported in Iraq under the name *Arenipses sabella* Hampson,1901 by Buxton (1920); Israel (Kehat and Greenberg,1969); Far east and North Africa (El-Haidari and Al-Hafidah, 1986); Libya (Bitaw and Ben Saad,1990); Egypt (Abdul Salam,1993); Sultanate of Oman (Elwan, 2000); Saudi Arabia (Badr El-Sabah *et al.*, 2010); Jordan (Al-Antary *et al.*, 2015).

Order, Hemiptera

Family, Asterolecaniidae

Palmaspis phoenicis (Ramachandra Rao, 1922)

Synonym: *Asterolecanium phoenicis* Ramachandra Rao

Common name: Green scale insect

Distribution: This species registered in Iraq under the synonym *Asterolecanium phoenicis* by Green (1923); Israel (Kehat and Amitai,1967); Saudi Arabia (Beccari,1971); Sudan (Abbas and El Nasr, 1992); Qatar (Yousof *et al.*, 2013); Iran (Moghaddam, 2013); Jordan (Al-Antary *et al.*, 2014).

Family, Tropicuchidae

Ommatissus lybicus de Bergevin, 1930

Common name: Dubas Bug

Materials examined: Many infested trees of date palms by Dubas bug (nymph and adults on leaves and fruits during spring and autumn) from many regions of some provinces in the middle of Iraq during May 2019.: Baghdad (Al Taji, Al-Mada'in and Abu-Ghraib districts); Karbala (Al-Autaishy and Al-husainya subdistrict, and Al-Hindiya districts); Najaf (Kufa District); Babylon (Al-Musayyib and Al-illah districts) and Diyala (Al Wajehiya and Miqdadiyah districts).

Distribution: Iraq (Hussein, 1963); Qatar (Al-Azawi,1986); Sudan (El-Haidarei,1982); Morocco (Wilson,1987); Libya (Bitaw and Ben Saad, 1990); from central Iran to the coasts of Persian Gulf and Oman Sea in all palm growing areas

(Gharib 1998); Tunisia (Zouba and Raeesi, 2010); Pakistan (Shah *et al.*, 2012).

(2) INSECTS OF CITRUS TREES:

Order, Diptera

Family, Tephritidae

Ceratitis capitata (Wiedemann, 1824)

Synonyms:

Ceratitis asparagi Bezzi, 1924

Ceratitis citripeda Efflatoun, 1924

Ceratitis citriperda Macleay, 1829

Ceratitis hispanica Breme, 1842

Pardalaspis asparagi Bezzi, 1924

Tephritis capitata Wiedemann, 1824

Trypeta capitata (Wiedemann, 1824)

Common name: Mediterranean fruit fly

Materials examined: (180 specimens) Baghdad province; Jaddria, 20♀♀ from of the Sweet orange *Citrus sinensis* L. Osbeck, 10.iii.2019, Abu- Ghraib, 8♀♀, 7 ♂♂, 6.x.2019; Wasit province, Numaniyah, 28♀♀, 22 ♂♂, 20.ii.2019; Karbala province, Al –Autaiшы district, 30♀♀, 10♂♂, 20.iii.2019. Diyala province, Al- Khalis district, 20♀♀, 15♂♂, 27.iii.2019; Miqdadiyah district, 15♀♀, 5♂♂, 25.xi.2019.

Distribution: This fly invasive to Iraq (Al-Haidary, 1947). It irradiated and appeared again as outbreak in Abu Saida district, Diyala province at 2006 in citrus orchids (AL-Jiboory, 2007). United state (Headrick and Goeden, 1996); Australia (Vera *et al.*, 2002); Argentina (Ovruski *et al.*, 2003); Ghana (Appiah *et al.*, 2009) Iran (Rajabiyan *et al.*, 2015); Syria (Mansour and Mohamad, 2016); Italy (Sciarretta *et al.*, 2018); Tunisia (Hafsi *et al.*, 2019).

Order, Lepidoptera

Family, Gracillariidae

Phyllocnistis citrella Stainton, 1856

Common name: citrus leaf minor (CLM)

Materials examined: many infested leaves by CLM were collected from Baghdad, Al-Ghreaat district from the mandarin orange *Citrus reticulata* Blanco, 1837 at 24.iii.2019; Karbala, Al–Autaiшы district from citrus leaves at 4.ii.2019; Diyala from leaves of the sweet orange *Citrus sinensis*, 10.iii.2019.

Remark: This species were found in Iraq and be serious pest of citrus orchids in 1992-1994 (Al-Barak 1994, Al-Jboory *et al.*, 2004), and appears again at 2019 in citrus orchids.

Distribution: Iraq (Gentry,1965); Florida (Heppner, 1993); Egypt (Abd El-Aziz, 1995); Lebanon (Methni, 1996); Morocco (Boughdad *et al.*,1999); Japan (Ujiye, 2000); Syria (Abu Kaf *et al.*, 2006); Pakistan (Mustafa *et al.*, 2013); Algeria (Dahmane and Chakali, 2020).

Order, Hemiptera

Family, Aleyrodidae

Trialeurodes vaporariorum (Westwood, 1856)

Common names: The Citrus Whitefly, greenhouse Whitefly.

Synonyms:

Aleurodes vaporariorum Westwood, 1856

Aleyrodes vaporariorum Westwood, 1856

Trialeurodes lecanioides (Maskell, 1879)

Trialeurodes mossopi Corbett, 1935

Trialeurodes natalensis Corbett, 1936

Trialeurodes nicotianae (Maskell, 1896)

Trialeurodes papillifer (Maskell, 1890)

Trialeurodes sesbaniae Corbett, 1936

Trialeurodes sonchi (Kotinsky, 1907)

Materials examined: Many pupal cases and adults of this insect were collected from citrus tree orchids from Diyala province, Miqdadiyah district, 20.iv.2019; and Wasit province, Al-Numaniyah, 20.iii.2019; Aziziyah, 18.ix.2019.

Distribution: Cosmopolitan and polyphagous at the world. Iraq (Al Mallo and Abdul Rassoul, 2000); Europe (Martin *et al.*, 2000); Indonesia (Nasruddin and Mound, 2016) Iran (Ebrahimif *et al.*, 2017).

Family, Diaspididae

Aonidiella orientalis (Newstead, 1894)

Common name: The Oriental Yellow scale

Synonyms:

Aonidiella cocotiphagus Ferris, 1938

Aonidiella orientalis McKenzie, 1937

Aonidiella pedroniformis McKenzie, 1939

Aonidiella pedronis McKenzie, 1939

Aonidiellata probana MacGillivray, 1921

Aspidiotus cocotiphagus Marlatt, 1908

Aspidiotus orientalis Newstead, 1894

Aspidiotus osbeckiae Leonardi, 1898

Aspidiotus osbeckiae Cockerell, 1897

Aspidiotus pedronis Green, 1905

Aspidiotus taprobanus Green, 1905

Chrysomphalus orientalis Lindinger, 1913

Chrysomphalus pedroniformis Cockerell & Robinson, 1915

Chrysomphalus pedronis Sanders, 1906

Chrysomphalus taprobanus Sanders, 1906

Furcaspis cocotiphaga MacGillivray, 1921

Furcaspis orientalis MacGillivray, 1921

Materials Examined: many infested leaves and fruits of orange trees were collected from Baghdad province, Al-

Kadhimiya 5.iii.2019; and Wasit province, Al-Numaniyah, 10.v.2019.

Distribution: This species is a tropical and subtropical with a wide-distribution, including: Middle East, West Indies, India, southern Asia, East Africa and South Africa, and northern Australia (CIE, 1978). In Iraq, it is reported by Hussain (1963).

(3) INSECTS OF POMEGRANATE TREES

Order, Hemiptera

Family, Aphididae

Aphis punicae Passerini, 1863

Synonyms:

Aphis durantae Theobald & F.V., 1917

Aphis durranti Das & B.C., 1918

Aphis punicae Shinji, 1922

Cerosipha punicae (Passerini, 1863)

Common name: Pomegranate aphid.

Materials examined: many aphids showed on the leaves and stems of Pomegranate trees from orchards in Diyala province, Miqdadiyah district, 24.vi.2019; Wasit province, Al-Numaniyah, 10.v.2019.

Distribution: Iraq (Bodenheimer and Swirski, 1957); Egypt (EL-Kady *et al.*, 1980); India (Ghosh, 1986); Iran (Alikhani *et al.*, 2010); Japan (Sugimoto, 2011); Tunisia (Ben Halima, 2012); Turkey (Görür *et al.*, 2012) Korea (Lee *et al.*, 2015); Mediterranean area (Cucozza *et al.*, 2016).

(4) INSECTS OF GRAPE SHRUBS

Order, Hemiptera

Family, Cicadellidae

Arboridia hussaini (Ghauri, 1963)

Synonym: *Zygina hussaini* Ghauri, 1963

Common Name: Grape vine leaf hopper.

Materials Examined: many specimens of this leafhopper were collected from the lower surface of leaves from Baghdad, 16.vi. 2019; Karbala province, Al-Autaishy district, 30.v.2019; Diyala province, Miqdadiyah, 20.vi.2019

Distribution: Iraq (Ghauri, 1963) as *Zygina hussaini*.

References

- Abbas, A.A. and El-Nasr, S.Y.E. (1992) The Sudan: new record of green pit scale insect *Asterolecanium phoenicis* Rao on date palm in the Sudan. *FAO Plant Protection Bulletin*, 40(3): 115.
- Abd El-Aziz, S.E. (1995). Biological studies of citrus leaf miner, *Phyllocnistis citrella* (Staint.) in Egypt. *Bulletin of Entomological Society of Egypt*, 73: 97-105.
- Abd-El-Hussian, A. (1985). Palm trees and date and their pests. College of Agriculture Basra University, Basra, Iraq.
- Abded Karim, A.M.A., Ghanem, I.A., Mansour, S.I. and Ben Salah, M. (2016). Some environment aspects and vitality to palm root borer *Oryctes agamemnon arabicus* Fairmair and *Oryctes elegans* Perell (Coleoptera: Scarabaeidae) in the Kingdom of Bahrain. Conference: International Conference on the Investment in Date Palm sector (reality and prospects) At: Muscat-Oman May 2016.
- Abdul- Rassoul, M.S. (1976). Checklist of Iraq natural history museum insects collection. Natural History Research Center, Publication no. 30: 41.
- Abdul-Rassoul, M.S. (1976). Identification of date palms borers. Training course, Iraq Natural History Research Center and Museum, University of Baghdad, 21. (In Arabic)
- Abdul Salam, A.I. (1993). Insect pests in Egypt and Arab countries and their control, Vol. 2. Cairo, Egypt, Academic Press. (In Arabic)
- Abo-Kaf, M., Aslan, A. and Ahmed, I. (2006) Morphology and biology of citrus leaf miner *Phyllocnistis citrella* (Lepidoptera: Gracillaridae) in Syria. *Arab Journal of Plant Protection*, 24(1): 45-48.
- Ait-Oubahou, A. and Yahia, E.M. (1999). Postharvest handling of dates. *Postharvest News and Information*, 10: 67-74.
- Al-Antary, T.M.; Al-Khawalda, M.M. and Ateyyat, M.A. (2014). Keys for identification arthropods pests attacking gate palm. *Bothalia Journal*, 44(8): 60-71.
- Al-Antary, T.M.; Al-Khawaldeh, M.M. and Ateyyat, M.A. (2015). Economic importance of date palm *Phoenix dactylifera* L. (Liliopsida: Arecales: Arecaceae) pests in Jordan Valley. *Brazilian Journal of Biological Sciences*, 2(3): 121-134.
- Al-Azawi, A.F. (1986). A survey of insects of date palms in Qatar. *Date Palm Journal*, 4 (2): 242-266.
- Al- Barak, H.T. (1994). Ecological and biological studies of citrus leaf miner *Phyllocnistis citrella* Stainton. M. Sc. thesis, University of Baghdad , College of Agriculture, 51 pp.
- Al-Deghairi, M. (2007). Seasonal fluctuation of the date palm fruit Stalk Borer, *Oryctes elegans* Prell (Coleoptera: Scarabaeidae), in date palm plantations in Al-Qassim region, Saudi Arabia. *Agricultural and Marine Sciences*, 12: 67-70.
- Al-Dhafer, H.M. and Alayeid, H.Y. (2014). Survey and relative abundance of insects (Insecta) excluding Lepidoptera from sixteen commercial date palm orchards using light traps at Riyadh province, Saudi Arabia. *African Entomology*, 22: 93-103.
- Al-Haidary, D. (1947). The fruit fly (Mediterranean fruit fly). *The Journal of Iraqi Agriculture*, 2(4): 229-225.
- Alikhani, M.; Rezwani, A.; Rakhshani, E. and Madani, S.M.J. (2010). Survey of aphids (Hem., Aphidoidea) and their host plant in central parts of Iran. *Journal of Entomological Research*, 2(2): 7-16.
- Al-Jiboory, I.J. (2007). *Ceratitidis capitata* (Wiedemann) (Diptera: Tephritidae) Mediterranean fruit fly (Medfly), Disaster pest in citrus and other fruits orchards. Leaflet, 43.
- AL-Jboory, I.J.; Abdul-Rassoul, M.S. and Saleh, S.J. (2004). New record of some biological enemies of citrus leafminer *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillaridae) in Iraq. *Bulletin of the Iraq Natural History Museum*, 10(2): 1-7.
- Al-Malo, I.M. and Abdul-Rasoul, M.S. (2000). A new species of genus *Trialeurodes* Cockere from Iraq

- (Homoptera, Aleyrodidae). Bulletin of the Iraq Natural History Museum, 9(2): 19-23.
- Al-Saeedi, H.M.L. (2015). Survey for species of genus *Oryctes* spp. (Coleoptera: Dynastidae) in middle and south of Iraq and evaluation some methods of their control. Thesis of Master Degree of Science in Agriculture (Plant Protection) (Insects). Department of Plant Protection, College of Agricultural, University of Baghdad. 139.
- Al-Sayedm, A.E. and Al-Tamiemi, S.S. (1999). Seasonal activity of fruit stalk borer, *Oryctes agamemnon* (Burm) in Saltanate of Oman. Egypt J. Arab. Res., 77: 1597- 1665.
- Appiah, E.F.; Afreh-Nuamah, K. and Obeng-Ofori, D. (2009). Abundance and distribution of the Mediterranean fruit fly *Ceratitidis capitata* (Diptera: Tephritidae), in Late Valencia citrus orchards in Ghana. International Journal of Tropical Insect Science, 29(1): 11-16.
- Atia, Z.M.; Kara, H.; Al-Dankali, A. and Kafo, A.A. (2009). Ecological and biological studies on palm frond borer, *Phonapate frontalis* in the Western Coastal Regions of Libya. Arab Journal of Plant Protect, 27E: 21.
- Badr El-Sabah, A.F.; Gameel, S.M.M. and Sayed, A.A. (2010). Control of the greater date moth *Arenipsex sabella* Hapsonm (Lepidoptera: Pyralidae) using biopesticides. Acta Horticulture, 882: 995-999.
- Beccari, F. (1971). Contribution to the knowledge of the entomofauna of Saudi Arabia. First list of insects, mites and nematodes. Rivista di Agricoltura Subtropicale e Tropicale, Firenze, 65: 178-211.
- Ben Halimam, M.K. (2012) Aphid fauna (Hemiptera, Aphididae) and their host association of Chott Mariem, coastal area of Tunisia. Annals of Biological Research, 3 (1): 1-11.
- Bitawm, A.A. and Ben Saad, A.A. (1990) Survey of date palm trees insect pests in Libya. Arab Journal of Plant Protection, 8: 76-72.
- Blumberg, D.S. (1975) Preliminary notes on the phenology and biology of *Batrachedra amydraula* Mery. (Lepidoptera: Cosmopterygidae), a new pest of date palms in Israel. Phytoparasitica, 3 (1): 55-57.
- Blumberg, D. (2008) Review: date palm arthropod pests and their management in Israel. Phytoparasitica, 36 (5): 411-448.
- Bodenheimer, F.S. and Swirski, E. (1957) The Aphidoidea of the Middle East. Jerusalem: The Weizmann Science Press of Israel, iv + 378 pp.
- Boughdad, A., Bouazzaoui, Y. and Abdelkhalek, L. (1999) Pest status and biology of citrus leaf miner, *Phyllocnistis citrella* in Morocco. Proceedings of 5th International Conference on Pest in Agriculture, 2: 251-259.
- Bureau of Entomology and Plant Quarantine (1950) List of pests recorded during the period July 1, 1947, to June 30, 1948, inclusive, as Intercepted in, on, or with plants and plant products entering United States Territory. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, Service and Regulatory Announcement, 1-44. (Cited in Spennemann, 2019).
- Buxton, P.A. (1920) Insect pests of dates and the date palm in Mesopotamia and elsewhere. Bulletin of Entomological Research, 11: 287-303.
- Carpenter, J.B. (1975) Notes on date culture in the Arab Republic of Egypt, Israel and the people's democratic republic of Yemen. Date Growers' Institute Report, 52: 18-24.
- Carpenter, J.B. and Elmer, H.S. (1978) Pests and diseases of the date palm. United States Department of Agriculture, Agriculture Handbook, 527, 1- 42.
- Cocuzza, G.M.C.; Nazzo, G.; Russo, A.; Giudice, V.L. and Bella, S. (2016). Pomegranate arthropod pests and their management in the Mediterranean area. Phytoparasitica, 44: 393-409.
- Dahmane, M. and Chakali, G. (2020) pattern of developmental stages of *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) on the surface of citrus leaves. Polish Journal of Entomology, 89(1): 1-6.
- Derwesh, A.I. (1965) A preliminary list of identified insects and arachnids of Iraq. Director of General Agricultural Research Projects Baghdad, Bulletin, no. 121: 123.
- CIE (1978). Distribution Maps of Pests, Map no. 386. Wallingford, UK: CAB International.
- Ebrahimif Jamshidnia, A. and Allahyari, H. (2017). Functional response of *Eretmocerus delhiensis* (Hymenoptera: Aphelinidae) on *Trialeurodes vaporariorum* (Hemiptera: Aleyrodidae) by Parasitism and Host Feeding. Journal of Insect Science, 17(2): 56: 1-5.
- Ehsine, M.; Belkadhi, M.S and Chaieb M (2009). Bio-ecologic observations on rhinoceros beetle *Oryctes agamemnon* (Burmeister 1847) on the palm dates oasis of Rjim Maatoug in south-western Tunisia. Journal of Arid Land Studies, 19(1): 379-382.
- El-Haidari, H.S. (1982) New records of dubas bug *Ommatissus binitatus lybicus* De Bergevin on date palm in Sudan. Date Palm Journal, 1: 308.
- El-Haidari, H.S. and Al-Hafidh, E.M.T. (1986) Palm and date arthropod pests in the near east and North Africa. Regional project for palm and dates research centre in the near east and North Africa. FAO, Baghdad, 126 pp. (In Arabic).
- El-Kady, E.A.; Amin, A.; Habib, S.A. and Emam, A.K. (1980) Feeding sites of six aphid species of genus *Aphis* L. on their host plants in Egypt. Bulletin of the Entomological Society of Egypt, 63: 163-174.
- El-Sherif, S.; Elwan, E.A. and Abd-El-Razik, M.I.E. (1998). Insect pests of date palm trees in Northern Sinai, Egypt. In: First international conference on date palms, 8-10 March. United Arab Emirates University, Al Ain, United Arab Emirates, 255-262.
- Elwan, A.A. (2000). Survey of the insect and mite pests associated with date palm trees in Al-Dakhliya region, Sultanate of Oman. Egyptian Journal of Agricultural Research, 78: 653-664.
- Futch, S.H. (2011). Identification of mites, insects, diseases, nutritional symptoms and disorders on citrus. University of Florida, Institute of Food and Agricultural Sciences, SP176, Florida Cooperative Extension Service, 153.
- GBIF Secretariat (2019) GBIF Backbone Taxonomy. Checklist dataset.
- Gentry, J.W. (1965) Crop Insects of Northeast Africa-Southwest Asia. Agricultural Research Service, United States Department of Agriculture, Agriculture Handbook no.273, Washington, 210.

- Gharib, A. (1998) Important Pests of Palm. Agricultural Research, Education & Extension Organization, Tehran, 41.
- Ghuri, M.S.K. (1963). A new grapevine leaf-hopper (Homoptera: Cicadelloidea) from Iraq. *Annals and magazine of Natural History, London (Ser.13)* 6: 381-383.
- Ghosh, L.K. (1986). A conspectus of Aphididae (Homoptera) of Himachal Pradesh in north-west Himalaya, India. *Zoological Survey of India, Technical Monograph*, 16: 1-282.
- Görür, G.; Akyildirim, H.; Olcabey, G. and Akyurek, B. (2012). The aphid fauna of Turkey: an updated checklist. *Archive of Biological Science, Belgrade*, 64 (2): 675-692.
- Green, E.E. (1923) On a small collection of Coccidae from Mesopotamia, with description of a new species. *Bulletin of Entomological Research*, 13: 469-470.
- Hafsi, A.; Rahmounib, R. and Chermitia, B. (2019) Detection of *Ceratitis capitata* Wiedemann (Diptera: Tephritidae) using trimedlure versus enriched ginger oil in citrus orchards. *International Journal of Pest Management*.
- Haldhar, S.M.; Maheshwar, S.K. and Muralidharan, C. M. (2017) Pest status of date palm (*Phoenix dactylifera*) in arid region of India. *Journal of Agriculture and Ecology*, 3: 1-11.
- Harhash, M.; Mourad, A.K. and Hammad, S.M. (2003) Integrated crop management of the lesser date moth *Batrachedra amydraula* Meyr. (Lepidoptera: Cosmopteridae) infesting some date-palm varieties in Egypt. *Communications in agricultural and applied biological sciences*, 68(4 Part A): 209-221.
- Headrick, D.H. and Goeden, R.D. (1996) Commentary: Issues concerning the eradication or establishment and biological control of the Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), in California. *Biological Control*, 6: 412-421.
- Heppner, J.B. (1993) Citrus leafminer, *Phyllocnistis citrella*, in Florida (Lepidoptera: Gracillariidae: Phyllocnistinae). *Tropical Lepidoptera*, 4 (1): 49-64.
- Hussain, A.A. (1963). Provisional list of insects pests and bibliography of insect fauna of Iraq. *Bulletin of the College of Science, University of Baghdad*, 7: 43-83.
- Ibrahim, R.A. and Alahmadi, S.S. (2015) Effect of *Syzygium aromaticum* cloves on larvae of the rhinoceros beetle, *Oryctes agamemnon* (Coleoptera: Scarabaeidae). *African Entomology*, 23(2): 458-466.
- Jatoi, F.A.; Sahito, H.A.; Kousar, T.; Mangrio, W.M. and Shah, Z.H. (2020) Biology, morphology and taxonomy of Lesser Date Moth, *Batrachedra amydraula* (Lepidoptera: Batrachedridae) under two different temperatures. *Pure and Applied Biology*, 9(1): 1137-1147.
- Kehat, M. and Amitai, S. (1967) The morphology and phenology of the scale *Asterolecanium phoenicis* Rao on date palms in the Bet Shean Valley. *Israel Journal of Agricultural Research*, 17: 85-93.
- Kehat, M. and Greenberg, S. (1969) The biology and phenology of *Arenipyses sabella* Hmps. and *Cadra figulilella* (Gregson) (Lepidoptera, Pyralidae) on dates in Israel. *Bulletin of Entomological Research*, 58: 411-419.
- Khalaf, M.Z.; Al-Rubeae, H.F.; Al-Taweel, A.A. and Naher, F.H. (2013) First record of Arabian Rhinoceros beetle *Oryctes agamemnon arabicus* Fairmaire on date palm in Iraq. *Agriculture and Biology Journal of North America*, 4(3): 349-351.
- Krell, F.T. (2006) Dynastinae, In: Löbl, I. and Smetana, A. (eds), *Catalogue of Palaearctic Coleoptera, Scarabaeoidea, Scirtoidea, Dascilloidea, Buprestoidea, Byrrhoidea*. Apollo Books, Stenstrup, Denmark, 3: 690.
- Krell, F.T. and Král, D. (2017) Order Coleoptera, family Scarabaeidae Subfamily Dynastinae. *Arthropod fauna of the UAE*, 6: 169-185.
- Latifian, M.; Ahmadzadeh, S. and Nikbakht, P. (2004) Host preference of date lesser moth (*Batrachedra amydraula* Meyr.) to Khuzestan native cultivars of date palm. *Seed and Plant*, 20: 215-223. (In Persian with English summary)
- Latifian, M. and Nejadian, E.S. (2009) Study of the lesser moth *Batrachedra amydraula* (Lepidoptera: Batrachedridae) distribution based on geostatistical models in Khuzestan Province. *Journal of Entomological Research*, 1 (1): 43-55.
- Lee, Y.; Lee, W.; Kim, H. and Lee, S. (2015) A new record of *Aphis punicae* Passerini, 1863 (Hemiptera: Aphididae) from Korea. *Journal of Asia-Pacific Entomology*, 18: 157-163.
- Mckenzie, H.L. (1938) The Genus *Aonidiella* (Homoptera; Coccoidea; Diaspididae). *Microentomology*, 3: 1-36.
- Mansour, M. and Mohamad, F. (2016) Seasonal occurrence of the Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann, 1824) (Diptera: Tephritidae) in southern Syria. *Polish Journal of Entomology*, 85(3): 311-323.
- Martin, J.M., Mifsud, D. and Rapisarda, C. (2000). The whiteflies (Hemiptera: Aleyrodidae) of Europe and Mediterranean Basin. *Bulletin of Entomological Research*, 90: 407-448.
- Mashal, M. and Albeidat, B. (2006) A survey on insect pests of date palm trees in Jordan (Research Note). *Jordan Journal of Agricultural Sciences*, 2: 94-104.
- Methni, J. (1996). Plant Protection News from Arab and Near East countries -Lebanon. *Arab and Near East Plant Protection Newsletter, FAO*, 23: 28.
- Moghaddam, M. (2013) An annotated checklist of the scale insects of Iran (Hemiptera, Sternorrhyncha, Coccoidea) with new records and distribution data. *Zookeys*, 334: 1-92.
- Mokhtar, A.M. (2009) Insect pests of date palm, *Current Challenges and Future Perspectives*. Date palm, 38.
- Muniappan, R.; Watson, G.W.; Vaughan, L.; Gilbertson, R. and Nousseurou, M. (2012) New records of Mealybugs, Scale Insects, and Whiteflies (Hemiptera: Sternorrhyncha) from Mali and Senegal. *Journal of Agricultural and Urban Entomology*, 28: 1-7.
- Mustafa, I.; Raza, A.M.; Aqeel, M.A.; Ahmed, H.; RiazKhan, M.; Ahmed, I. and Arshad, M. (2013) Correlation of Citrus Leaf Miner (*Phyllocnistis citrella* Stainton) with Snail Population in District Sargodha, Punjab, Pakistan. *Pakistan Journal of Zoology*, 45(2): 453-458.
- Muzaffarian, F. (2018) An identification key of Auchenorrhyncha of Iranian recorded as pests in orchards and review oh pest status of the species. *Zootaxa*, 4420(4): 475-501.
- Nasruddin, A. and Mound, L.A. (2016) First record of *Trialeurodes vaporariorum* Westwood (Hemiptera: Aleyrodidae) severely damaging field grown potato

- crops in South Sulawesi, Indonesia. *Journal of Plant Protection Research*, 56(2): 199-202.
- Ovruski, S.; Schliserman, P. and Aluja, M. (2003) Native and introduced host plants of *Anastrepha fraterculus* and *Ceratitis capitata* (Diptera: Tephritidae) in Northwestern Argentina. *Journal of Economic Entomology*, 96: 1108-1118.
- Rajabiyan, M.; Shayanmehr, M. and Sharif, M.M. (2015) The Mediterranean fruit fly (*Ceratitis capitata*) in Iran: genetic diversity and comparison with other countries. *Journal of Entomological and Acarological Research*, 47(4055): 20-25.
- Ramos, A.A. and Caballero, A. (2017) Diaspididae on *Citrus* spp. (Rutaceae) from Colombia: New records and a taxonomic key to their identification. *Revista Facultad Nacional de Agronomía Medellín*, 70 (2): 8139-8154.
- Satyagopal, K.; Sushil, S.N.; Jeyakumar, P.; Shankar, G.; Sharma, O.P.; Sain, S.K.; Boina, D.R.; Lavanya, N.; Varshney, R.; Sunanda, B.S.; Asre, R.; Kapoor, K.S.; Arya, S.; Kumar, S.; Patni, C.S.; Chattopadhyay, C.; Ray, P.K.; Kadam, U.K.; Bhatt, J.; Dhapure, S.R.; Ekabote, S.K.; Thakare, A.Y.; Halepyati, A.S.; Patil, M.B.; Sreenivas, A.G.; Sathyanarayana, N. and Latham S. (2014) AESA based IPM package for Pomegranate. National Institute of Plant Health Management, Rajendranagar, Hyderabad, India, 38.
- Sciarretta, A.; Tabilio, M.R.; Lampazzi, E.; Ceccaroli, C.; Colacci, M. and Trematerra, P. (2018) Analysis of the Mediterranean fruit fly [*Ceratitis capitata* (Wiedemann)] spatio-temporal distribution in relation to sex and female mating status for precision IPM. *PLoS ONE*, 13(4): 1-23.
- Shafiean, A. (2017) Date Palm. Tropical and Semi-Tropical Fruit Office, Department of Horticulture, Teheran, 129.
- Shah, S.; Ul-Mohsin, A.; Bodlah, I.; Naeem, M. and Hafez, Z. (2012) Dubas Bug, *Ommatissus lybicus* (Tropiduchidae: Hemiptera) - A new record from Panjgur, Balochistan, Pakistan. *Pakistan Journal of Zoology*, 44(6): 1765-1769.
- Spennemann, D.H.R. (2019). Global distribution of the date stone beetle, *Coccotrypes dactyliperda* (Coleoptera: Curculionidae, Scolytinae). *Journal of Insect Biodiversity and Systematics*, 4 (3): 203-226.
- Sugimoto, S. (2011). The taxonomic identity of *Aphis punicae* (Hemiptera: Aphididae) Shinji, 1922. *Entomological Science*, 14: 68-74.
- Ujiye, T. (2000) Biology and control of the citrus leaf miner, *Phyllocnistis citrella* in Japan. *Japan Agricultural Research Quarterly* 34(3): 167-173.
- Vera, M.; Rodriguez, R.F.; Segura, D.F. and Cladera, J.L. (2002) Potential geographical distribution of the Mediterranean fruit fly, *Ceratitis capitata* (Diptera: Tephritidae), with emphasis on Argentina and Australia. *Environmental Entomology*, 31(6):1009-1022.
- Wilson, M.R. (1987). The Auchenorrhyncha (Homoptera) associated with palms. In: Wilson, M.R. and Nault, L.R. (eds), *Proceedings of the second International Workshop on Leafhoppers and Plant hoppers of Economic Importance*, 28 July-1 August, 1986. Wallingford, UK: CAB International, p 327-342.
- Wiltshire, E.P. (1957). *The Lepidoptera of Iraq*. Government of Iraq (Ministry of Agriculture), Revised and Enlarged Edition, 160 pp.
- Yousof, D.E.; Mahmoud, M.E.E. and Hohamed, A.H. (2013). Prospects of biological control of date palm green pit scale insect *Asterolecanium phoenicis* Rao (Homoptera: Asterolecaniidae) in Sudan. *Persian Gulf Crop Protection*, 2(2): 42-48.
- Zouba, A. and Raeesi, A. (2010). First report of *Ommatissus lybicus* Bergevin (Hemiptera: Tropiduchidae) in Tunisia. *The African Journal of Plant Science and Biotechnology*, 4(2): 98-99.