

Fly Fauna of Livestock's of Marvdasht County of Fars Province in the South of Iran

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(Received: 5 August 2018; accepted: 13 August 2018)

Flies damage the livestock industry in many ways, including damages, physical disturbances, the transmissions of pathogens and the emergence of problems for livestock like Myiasis. In this research, the fauna of flies of Marvdasht County was investigating, which is one of the central counties of Fars province in southern Iran. In this study, a total of 20 species of flies from 6 families and 15 genera have been identified and reported. The species collected are as follows:

Muscidae: *Musca domestica* Linnaeus, 1758, *Musca autumnalis** De Geer, 1776, *Stomoxys calcitrans*** Linnaeus, 1758, *Haematobia irritans*** Linnaeus, 1758

Fanniidae: *Fannia canicularis** Linnaeus, 1761

Calliphoridae: *Calliphora vomitoria** Linnaeus, 1758, *Chrysomya albiceps** Wiedemann, 1819, *Lucilia caesar** Linnaeus, 1758, *Lucilia sericata** Meigen, 1826, *Lucilia cuprina** Wiedemann, 1830

Sarcophagidae: *Sarcophaga africa** Wiedemann, 1824, *Sarcophaga aegyptica** Salem, 1935, *Wohlfahrtia magnifica*** Schiner, 1862

Tabanidae: *Tabanus autumnalis** Linnaeus, 1761, *Tabanus bromius** Linnaeus, 1758

Syrphidae: *Eristalis tenax** Linnaeus, 1758, *Syrirta pipiens** Linnaeus, 1758, *Eupeodes nuba** Wiedemann, 1830, *Syrphus vitripennis*** Meigen, 1822, *Scaeva albomaculata** Macquart, 1842

Species identified with * for the first time in the county and the species marked with ** are reported for the first time from the Fars province.

Keywords: Diptera, livestock, Myiasis, Marvdasht, Fars, Iran.

Flies are identified as disturbing species in urban and rural environments and considered one of the most important carriers of disease and death in the worldwide (Taubes, 2000). Many researchers around the world have studied insect species; including Diptera. A list of 835 Palearctic species of the family Muscidae was published in the catalogue written by Pont in 1986, and 59 of them reported by foreign researchers from Iran (Pont, 1986). In Iran, various researchers have been working on the families, genera and harmful species of order Diptera. Among these families, Calliphoridae and Sarcophagidae are very important because they can transmit the myiasis to animals and humans (Chan et al., 2005; Marinho et al., 2006).

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Taxonomic studies in Iran show that myiasis in humans and livestock is caused by the insects of these two families (Shoorijeh et al., 2009; Namazi et al., 2009; Hall et al., 2009). Both families were surveyed by (Khoobdel et al., 2008) in Iran and a total of 13 species were identified and reported.

The fly fauna of Muscidae and Fanniidae which are the most important insects that carry the pathogens to humans and livestock were studied by Khoobdel and Davari (2011). House fly belonging to the family Muscidae one of the most important insect, which is capable of transmitting pathogens. Other species of this family are not known as insects that contribute to the formation of the myiasis but in some cases, they are introduced as secondary agents in the development of myiasis (Brown et al., 2009). Fanniidae is a small family with 4 genera, and the most important genus of this family is *Fannia*. This genus is important in terms of medicine and veterinary medicine (Pont, 2002). Insects in this family have been collected and identified in many parts of the world (Rozkošný et al., 1997). Several lists of the flies in this family have been presented in Iran (Tüzün et al., 2010; Khoobdel and Davari, 2011; Dabiri, 2011).

Tabanidae is a large family of Diptera. This family contains blood-feeding insects the hematophagous habit is also very important for livestock economically because a number of pathogens are transmitted by tabanid species (Baldacchino et al., 2014; Maity et al., 2016). Flies of this family are important factors in reducing the milk production of cattle in livestock farms (Datta et al., 1997). Various systematic studies have been done on Tabanidae in Iran and some species have been identified (Abbasian-Lintzen, 1960; Abbasian-Lintzen, 1961; Dousti et al., 2011; Samiei et al., 2016).

The family Syrphidae has more than 6,000 species described throughout the world (Miranda et al., 2013). The insects of this family are important for pollination and predation (Ssymank et al., 2008). Some species of this family such as *Eristalis tenax* in the larval stage can cause the myiasis (Salimi et al., 2010; Ramezani Awal Riabi et al., 2017).

It is very necessary to identify livestock's fly fauna to control them. For this reason, this research was conducted to control the population of flies in livestock farms. It is known that some fly species in livestock cause myiasis and other livestock diseases; therefore the identification of different fly species in the dairy farm is very important. The failure to identify them and consequently failure to choose the right way to manage the problems caused by flies will reduce the effectiveness of the control.

Material and Methods

The present research was carried out in Marvdasht dairy farms; Marvdasht County is one of the main counties of Fars province of Iran, the geographical coordinates of the Marvdasht (research area) are 29°52' N, 52°48' E. Sampling was carried out on 12 dairy farms in different parts of Marvdasht county, the points are as follows:

Falunak (29°59'N, 52°41'E), Fakhrabad (29°58'N, 52°42'E), Kuh Sabz (29°55'N, 52°42'E), Shahrak Khara (30°00'N, 52°37'E), Esfadrán (29°59'N, 52°44'E), Majdabad (29°54'N, 52°39'E), Kamarzard (29°56'N, 52°38'E), Dehbid (29°54'N, 52°48'E), Kenareh (29°54'N, 52°51'E), Shule Sarooei (30°01'N, 52°50'E), Fathabad (29°56'N, 52°48'E), Shamsabad (29°54'N, 52°54'E)

For the better understanding the results, for each location, an upper case letter was considered which include: Falunak (A), Fakhrabad (B), Kuh Sabz (C), Shahrak Khara (D), Esfadrán (E), Majdabad (F), Kamarzard (G), Dehbid (H), Kenareh (I), Shule Sarooei (J), Fathabad (K), and Shamsabad (L).

The sampling points are shown in Fig. 1, in this Figure, 12 sampling localities are shown on the map.

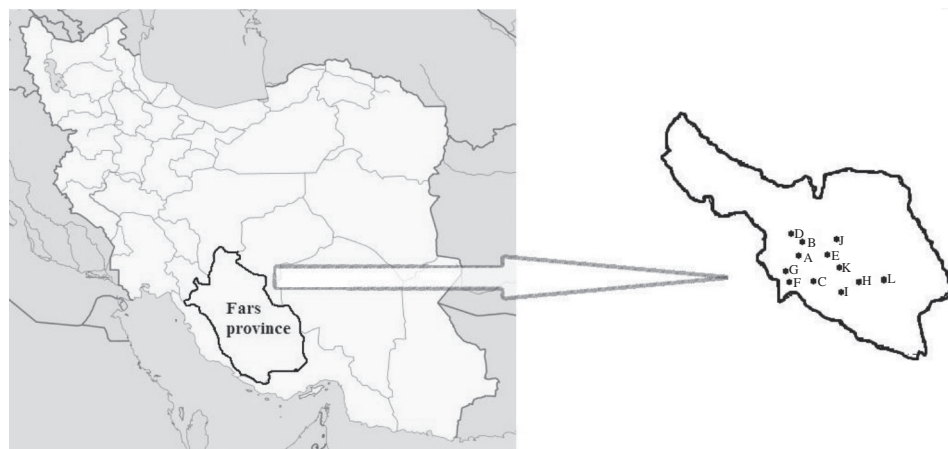


Fig. 1. Sampling locations in Marvdasht dairy farms

Various methods such as insect net, light trap, and sticky trap were used to collect flies inside the dairy farms of Marvdasht County. The method of using the insect net was that in each dairy farm's hall, 20 net sweeps were done, then the trapped insects were killed and stored in alcohol. Light traps were installed at the roof of the cattle halls. Each morning, the traps were examined and samples were collected. The flies were caught inside a glass of cyanide-containing potassium cyanide, and then the specimen specification was done, including the time and place of catch, was attached and transported to the laboratory for diagnosis.

Identification of the specimens was performed using the keys of the families Muscidae, Fanniidae, Calliphoridae, Sarcophagidae, Tabanidae and Syrphidae. For identifying some fly species, it was assisted by various researchers who specialize in identifying the respective family.

For identification of flies, genitalia of the male (aedeagus and other appendages) were used, to make slide from genitalia, cut the end of the male insect's abdomen and they were placed in Petri dishes containing 10% potassium. After softening and destroying the fatty tissues, the genital system was removed from the potassium solution and washed with distilled water and placed on a slide in a drop of glycerin solution and placed on it. In order to identify the fly species the identification keys by Herting and Dely-Draskovits (1993), Pape (1996), Carvalho (2002), Speight (2010) and Marshall et al. (2011) were used.

Results

In this research, a total of 20 species of flies from 6 families and 15 genera were collected. The information about the species collected and their distribution are as follows:

Musca domestica Linnaeus, 1758

The house fly body length 6–8 mm. The highest abundance of insects caught in all dairy farms was related to this species. This species has a global distribution and cosmopolitan, so it has been reported in many parts of Iran.

Collecting places: A (150♂ 187♀), B (125♂ 113♀), C (78♂ 69♀), D (102♂ 117♀), E (46♂ 59♀), F (91♂ 98♀), G (58♂ 65♀), H (40♂ 37♀), I (74♂ 66♀), J (74♂ 55♀), K (15♂ 21♀), L (76♂ 73♀)

Distribution: Cosmopolitan

Musca autumnalis De Geer, 1776

This insect is called face fly. It is similar to the house fly, and its size is slightly larger than the house fly and about 7–8 mm in length. This species has been reported in Iran from Tehran (Khoobdel and Davari, 2011), Mazandaran (Zielke, 2017), Urmia (Moradi et al., 2013) and Fars (Akbarzadeh et al., 2012).

This species was reported for the first time from Marvdasht County.

Collecting places: A (14♂ 18♀), D (3♂ 1♀), J (2♂ 1♀)

Distribution: Europe, Russia, China, North Africa, Korea, Japan, Iran (Pickens and Miller, 1980)

Stomoxys calcitrans Linnaeus, 1758

This insect is called stable fly, adults are 6–8 mm in length, unlike other Muscidae species their mouthparts are piercing-sucking. This insect reduces milk production in cattle dairy farm (Murchie et al., 2018) the presence of this fly in the dairy farm is very important because of the transmission of many pathogens to cows (Baldacchino et al., 2013). This species has been reported in Iran from Tehran (Khoobdel and Davari, 2011), Kashan (Dehghani et al., 2014), Urmia (Moradi et al., 2013).

This species was reported for the first time from Fars province.

Collecting places: A (8♂ 7♀), C (1♂ 2♀), D (2♂ 1♀), J (0♂ 1♀)

Distribution: USA and Denmark (Birkemoe and Sverdrup-Thygeson, 2011), Brazil (Dominghetti et al., 2015), Northern Ireland (Murchie et al., 2018), Iraq (Hadi and Al-Amery, 2012).

Haematobia irritans Linnaeus, 1758

This insect is called horn fly; adults are 3–5 mm in length. It is a blood-feeding parasite of cattle. This species has been reported in Iran from Urmia (Moradi et al., 2013).

This species was reported for the first time from Fars province.

Collecting places: A (3♂ 4♀), E (2♂ 2♀)

Distribution: Japan (Iwasa and Ishiguro, 2006), Taiwan (Huang et al., 2006), Israel (Müller et al., 2011), Brazil (Barros et al., 2012), USA, Argentina and Mexico (Guglielmo et al., 1998).

Fannia canicularis Linnaeus, 1761

This insect is called Little House fly or Lesser House fly, the body length of the insect varies from 4.5 mm to 7 mm. This species has been reported in Iran from Tehran (Khoobdel and Davari, 2011), Urmia (Dabiri, 2011), Shiraz (Habibi et al., 2018)

This species was reported for the first time from Marvdasht County.

Collecting places: A (1♂ 3♀), C (1♂ 0♀), F (2♂ 4♀)

Distribution: China (Wang et al., 2007; Chen et al., 2013), Brazil (Lira et al., 2014), Iraq (Hammodi Hasson, 2016), Palaearctic, Nearctic, Australasian and Oceanian regions (Wang et al., 2007).

Calliphora vomitoria Linnaeus, 1758

This insect is called Blue bottle fly, the body length of the adult is 10–14 mm. The color of the body is metallic blue with red eyes. This species has been reported in Iran from Tehran (Khoobdel et al., 2008), Urmia (Tüzün et al., 2010), Shiraz (Keshavarzi et al., 2015)

This species was reported for the first time from Marvdasht County.

Collecting places: A (25♂ 23♀), D (16♂ 13♀), H (8♂ 9♀), K (8♂ 10♀), L (3♂ 4♀)

Distribution: Belgium (Frederickx et al., 2011), Czech Republic (Šuláková and Barták, 2013), Iraq (Hammodi Hasson, 2016), Iran, Israel, Pakistan, Saudi Arabia, Syria, Turkey (Akbarzadeh et al., 2015).

Chrysomya albiceps Wiedemann, 1819

Body length of the insect is 10–14 mm; the larva of this insect causes myiasis. This species has been reported in Iran from Bandar Abbas (Parchami-Araghi, 1995), Greater Tunb, Lesser Tunb and Abu-Musa (Khoobdel et al., 2013), Tehran (Khoobdel and Davari, 2011), Shiraz (Keshavarzi et al., 2015), Kazerun (Parkhideh et al., 2017), Khuzestan (Fakoorziba et al., 2017).

This species was reported for the first time from Marvdasht County.

Collecting places: A (53♂ 43♀), B (25♂ 26♀), C (21♂ 23♀), D (18♂ 17♀), E (8♂ 8♀), F (3♂ 5♀), G (6♂ 5♀), J (7♂ 4♀), K (2♂ 3♀), L (5♂ 3♀)

Distribution: Brazil (Pujol-Luz and Barros-Cordeiro, 2012), Italy (Vanin et al., 2009), Egypt, Israel, Iran, Iraq, Kuwait, Lebanon, Libya, Oman, Pakistan, Saudi Arabia, Syria, United Arab Emirates, Turkey (Akbarzadeh et al., 2015), India (Chakraborty et al., 2017), Northwestern India to southern Africa and USA (Wells and Sperling, 1999).

Lucilia caesar Linnaeus, 1758

The adult body length is 7–11 mm and the body color is metallic green, legs and antenna are black. This species has been reported in Iran from Tehran (Khoobdel et al., 2008), Shiraz (Keshavarzi et al., 2015)

This species was reported for the first time from Marvdasht County.

Collecting places: A (8♂ 7♀), B (12♂ 14♀), C (2♂ 3♀), D (4♂ 6♀), F (5♂ 4♀), G (2♂ 2♀), I (4♂ 3♀), J (1♂ 3♀), K (4♂ 5♀), L (5♂ 3♀)

Distribution: Czech Republic (Šuláková and Barták, 2013), Italy (Rognes, 2014), India (Chakraborty et al., 2017), Middle East, Egypt, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Oman, Saudi Arabia, Syria, Turkey, Pakistan (Akbarzadeh et al., 2015).

Lucilia cuprina Wiedemann, 1830

This insect is called Australian sheep blowfly, the adult body length is 6–9 mm. This species has been reported in Iran from Chaharmahal-Bakhtiary (Pirali-Kheirabadi et al., 2010), Kazerun (Parkhideh et al., 2017)

This species was reported for the first time from Marvdasht County.

Collecting places: A (3♂ 4♀), B (6♂ 3♀), C (1♂ 4♀), G (3♂ 4♀)

Distribution: India (Bansode et al., 2016), Egypt (Abu Zied et al., 2003), Malaysia (Paul et al., 2009), South Africa (Williams et al., 2014)

Sarcophaga africa Wiedemann, 1830

The adult body length is 7–10 mm, the general color of the body is gray and a few black bars are on the thorax. This species has been reported in Iran from Kermanshah (Salimi et al., 2017), Greater Tunb and Abu-Musa (Khoobdel et al., 2013), Gheshm (Khoobdel et al., 2015), Kazerun (Parkhideh et al., 2017).

This species was reported for the first time from Marvdasht County.

Collecting places: A (5♂ 4♀), B (4♂ 4♀), C (2♂ 3♀), D (2♂ 1♀)

Distribution: South Africa (Villet et al., 2017), Poland (Kaczorowska, 2009), India (Chakraborty et al., 2017)

Sarcophaga aegyptica Salem, 1935

The adult body length is 10–12 mm, the general color of the body is gray and a few black bars are on the thorax. This species has been reported in Iran from Abu-Musa (Khoobdel et al., 2013), Fars (Akbarzadeh et al., 2012), Gheshm (Khoobdel et al., 2015), Kazerun (Parkhideh et al., 2017)

This species was reported for the first time from Marvdasht County.

Collecting places: A (15♂ 14♀), B (14♂ 18♀), C (12♂ 13♀), D (8♂ 3♀), E (10♂ 6♀), F (0♂ 3♀), G (1♂ 8♀), K (6♂ 8♀), L (7♂ 12♀)

Distribution: South Africa (Villet et al., 2017), China (Ren et al., 2018), India (Nandi, 2002)

Wohlfahrtia magnifica Schiner, 1862

This insect is called spotted flesh fly; the adult body length is 6–10 mm. Larvae of this species make myiasis in livestock farms. This species has been reported in Iran from Bushehr (Mohammadzadeh et al., 2008), Isfahan (Dehghani et al., 2012), Greater Tunb, Lesser Tunb and Abu-Musa (Khoobdel et al., 2013)

This species was reported for the first time from Fars province.

Collecting places: A (6♂ 5♀), D (7♂ 3♀), G (4♂ 2♀)

Distribution: Pakistan, Saudi Arabia, countries neighborhood of west sides of the Red Sea, Egypt, Libya, Tunisia, Mauritania, Senegal and Guinea (Spradbery, 2002)

Tabanus autumnalis Linnaeus, 1761

This insect is called large marsh horsefly; the adult body length is 18–22 mm. This species has been reported in Iran from Fars (Abbassian-Lintzen, 1960), Kerman, Sistan and Baluchestan, Gorgan, Isfahan, Kordestan (Abbassian-Lintzen, 1964), Khorasan (Sadeghi Namghi and Zeegers, 2005)

This species was reported for the first time from Marvdasht County.

Collecting places: C (4♂ 1♀), D (3♂ 2♀)

Distribution: Iraq, Saudi Arabia, Oman, Jordan, Syria, Kuwait, Turkey, Egypt, Hungary, Italy, Croatia, United Kingdom, USA, Mexico, Brazil, Chile, Colombia (Jasim et al., 2015), Bosnia and Herzegovina (Mikuška et al., 2008)

Tabanus bromius Linnaeus, 1758

This insect is called band-eyed brown horsefly; the adult body length is 13–16 mm. This species has been reported in Iran from Shiraz (Dousti et al., 2011), Kazerun (Abbassian-Lintzen, 1960)

This species was reported for the first time from Marvdasht County.

Collecting places: K (2♂ 1♀)

Distribution: Bosnia and Herzegovina (Mikuška et al., 2008), Turkey (Altunsoy and Kiliç, 2010), India (Maity et al., 2016)

Eristalis tenax Linnaeus, 1758

This insect is called drone fly; the adult body length is 12–15 mm. This species has been reported in Iran from Arak (Salimi et al., 2010), Khorramabad, Dorud, Poldokhtar (Bahirai et al., 2014), Oromieh, Fars, Ahwaz, Hamadan, Gorgan, Guilan, Marand, Mashhad, Mazandaran, Sistan (Dousti and Hayat, 2006).

This species was reported for the first time from Marvdasht County.

Collecting places: A (6♂ 3♀), B (5♂ 7♀), C (2♂ 1♀), D (3♂ 1♀), E (0♂ 2♀), F (1♂ 0♀), G (2♂ 1♀), K (7♂ 5♀), L (5♂ 4♀)

Distribution: Spain (Clavel et al., 2011), China (Li et al., 2017), England (Basley et al., 2018), cosmopolitan, the most widely distributed syrphid species in the world, known from all regions except the Antarctic, found throughout Europe except in the far north (Dousti and Hayat, 2006)

Syrpitta pipiens Linnaeus, 1758

This insect is called thick-legged hoverfly; the adult body length is 4.5–7 mm. The larvae of these flies in husbandry feed on animal waste. This species has been reported in Iran from Semnan (Samin et al., 2016), Ilam (Bedoreh and Ansari pour, 2012),

Oromieh, Ahwaz, Gorgan, Guilan, Mashhad, Kashmar and Bardaskan, Khorasan, Kurdistan, Mazandaran (Dousti and Hayat, 2006)

This species was reported for the first time from Marvdasht County.

Collecting places: A (10♂ 8♀), B (6♂ 7♀), C (6♂ 4♀), D (9♂ 7♀), E (5♂ 6♀), F (3♂ 1♀), G (4♂ 4♀), K (3♂ 4♀)

Distribution: Palaearctic, including North Africa, most of North America, South America and the Oriental region (Samin et al., 2016)

Eupeodes nuba Wiedemann, 1830

The adult body length is 4.5–7 mm; this species has been reported in Iran from Khorasan Razavi (Shojaei Hesari and Pashaei Rad, 2015), Ahwaz (Dousti, 1999), Khorramabad, Fars, Gorgan, Guilan, Mashhad, Kashmar and Bardaskan, Khorasan, Kurdistan, Mazandaran (Dousti and Hayat, 2006), Ilam (Bedoreh and Ansari pour, 2012)

This species was reported for the first time from Marvdasht County.

Collecting places: A (6♂ 5♀), B (5♂ 5♀), C (4♂ 5♀), D (8♂ 3♀), L (2♂ 1♀)

Distribution: China (Jilong et al., 1998), Turkey (Reemer and Smit, 2007), Serbia (Nedeljković et al., 2009), Portugal (Pita et al., 2009), Canary Islands, southern France to Italy, former Yugoslavia, Crete, Cyprus, Lebanon, Israel, Egypt, Morocco, Switzerland, Romania, Uzbekistan, Kirghizia, Afghanistan, Mongolia, Ethiopia (Shojaei Hesari et al., 2016)

Syrphus vitripennis Meigen, 1822

The adult body length is 8–10 mm; this species has been reported in Iran from Neyshabur (Sadeghi Namaghi and Husseini, 2009), Khorasan (Shojaei Hesari and Pashaei Rad, 2015), East Azerbaijan (Ehteshamnia et al., 2010), West Azerbaijan, Oromieh, Khorasan-e-Razavi, Mashhad, Kashmar and Bardaskan, Golestan province, Gorgan, Mazandaran (Dousti and Hayat, 2006).

This species was reported for the first time from Marvdasht County.

Collecting places: A (3♂ 2♀), C (2♂ 1♀), D (1♂ 0♀), L (1♂ 2♀)

Distribution: Portugal (Pita et al., 2009), Serbia (Nedeljković et al., 2009), Poland (Wojciechowicz-Żytko and Wnuk, 2012), Africa, California, Alaska, Iran (Ehteshamnia et al., 2010)

Scaeva albomaculata Macquart, 1842

The adult body length is 8–10 mm; this species has been reported in Iran from Oromieh, Charmahal and Bakhtiari, Fars, Ahwaz, Gorgan, Mashhad, Brojerd, Karaj, Miandoab, Zabol, Kashmar and Bardaskan, Khorasan, Kurdistan, Shiraz, Kuzestan (Dousti and Hayat, 2006)

This species was reported for the first time from Marvdasht County.

Collecting places: A (3♂ 1♀), B (4♂ 2♀), C (3♂ 2♀), D (1♂ 1♀), E (1♂ 0♀), F (0♂ 2♀), G (1♂ 3♀), K (1♂ 1♀), L (2♂ 1♀)

Distribution: Iberian Peninsula and round the Mediterranean basin to Morocco, Canary Islands, eastward through southern Russia, the Caucasus and southern Siberia to the far east and northern China, Afghanistan, Mongolia; highly migratory and occasionally reaches as far north as Britain (Dousti and Hayat, 2006)

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