

Prevalence and Salient Morphological Features of Myiasis Causing Dipteran Flies in Jeddah, Saudi Arabia

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A number of dipteran fly species are found in Jeddah with public health and veterinary importance due to their association with myiasis of livestock and humans. Although several reports are available on the myiasis causing flies from different parts of Saudi Arabia very little is known available on prevalence and characterization of these flies from Jeddah Province, which include the major harbour on the Red Sea, western Saudi Arabia and acts the gateway for millions of live animals in the kingdom. Therefore to fill this knowledge gap, the objective of this work is to fill up this gap. For fly survey, the adult flies were collected by the means of Malaise & Bait traps and sweeping nets from different marked locations including slaughter houses and live animals farms. The total number of flies from each locality was counted and were sorted for taxonomic species identification using specific pictorial keys. In this study, ten dipteran fly species belonging to six families were identified as causing myiasis on the basis of reported cases in Saudi Arabia. The flies collected during the survey were *Megaselia scellaris*, *Musca domestica*, *Fanniia canicularis*, *Sarcophaga haemorrhoidalis* (*Bercaea cruentata*); *Parasarcophaga ruficornis*, *Wohlfahrtia nuba*, *Chrysomya marginalis* C. *albicep*, *C. megacephala*, and *Oesteris ovis*. Among collected flies the highest number were of *Musca domestica* (67.6%) and the rest were other species. Most of the species were collected from slaughter houses (50%) followed by animal farms (39%). The present study identified a number species of myiasis-causing flies of the public health and veterinary significance, which should inform wider studies on their seasonal abundance, significance and consequent implementation of preventive control measures.

Keywords: Diptera, Flies, Myiasis, Morphology, Prevalence.

Myiasis is defined as parasitic infestation of the body organs of vertebrate animals and humans by a variety of fly species maggots that feed upon living or dead tissues (Zumpt, 1965)

Myiasis can be classified as anatomical which includes open wounds, furuncular, intestinal

or cavity myiasis or ecological which includes obligatory, facultative and accidental (Pseudo myiasis) (Derraik et al 2010).

Obligatory or specific myiasis is caused by parasitic flies which require living tissues for their larval development. Facultative or semi-

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specific myiasis is caused by opportunistic flies which live freely and lay eggs on the decaying organic matter and invade the living tissues especially pre-existing wounds. Accidental or pseudo-myiasis occurs when the food contaminated with fly eggs or larvae is ingested by host animals which subsequently develop pathological reactions (Hall, 1991).

Myiasis is distributed worldwide especially in poor socioeconomic regions of tropical and subtropical countries (Francesconi, and Lupi, 2012). From Saudi Arabia many workers reported different forms myiasis in vertebrate animals and humans (Omar & Abdullah, 1992; Badawi 1994; Fatani & Hilali 1994; Hall & Wall 1995; Khayat 2002; Al Ahmad et al 2006; Wakid 2008; Bosly 2013 and Zagloul et al 2013,) however, there is a paucity of literature on the identification and the habitats of myiasis causing flies found in Jeddah which is a large commercial city and harbour, through which where millions of livestock enter the kingdom annually and a metropolis with large number of animal sheds. Therefore, the objective of this study was to identify the myiasis causing flies in Jeddah and characterize the habitats. The results will provide important information that will enable the veterinary and public health authorities to identify the flies rapidly and accurately and to take appropriate actions for myiasis prevention and control.

MATERIAL AND METHODS

Flies were collected from slaughter houses (abattoirs), animal farms, fish and vegetable markets of Jeddah city. Jeddah is a metropolis and a commercial city and harbour located on the west coast of Red Sea. (Latitude 21.29 N and Longitude 39.7 E). The climate is usually moderate except during summer when the temperature is high

which might reach 45°C, and winter is moderately temperate. The average high is approximately 35°C and low average is about 23°C. The average relative humidity is approximately between 50% to 60 %.

myiasis causing adult flies were collected by the means of Malaise traps, bait traps and sweeping nets from previously marked locations. These locations included slaughter houses located in the districts of municipalities: Abhur, Al Mattar, Um Elsalam, Al Balad and Al-Janoub (Table-1), while the animal farms especially sheep, goats, camel & horse paddocks located in South Jeddah, East of Harmain Road, Al Nuzah, Um Elsalam, Al Jamia, Asfan and Dhahban districts.

After preservation adult flies were morphologically characterized and classified with the help of available authentic keys. (Akbarzadeh et al 2015; Al ahmadi and Salem et al 1999, Al Ghamdi and Alikhan 2015; Alikhan et al 2016; Dabbour and El Dawy 1981, Irish et al. 2014; Mc Alpine 1989; Nazni et al 2011; Pont 1991; Setyaningrum and Al Dhafer, 2014; Szpila 2012; Verves 2005).

In the present paper we mentioned only salient morphological features of the flies. The detailed identification key was already published in previous paper (Alikhan et al 2016).

RESULTS AND DISCUSSION

According to morphological identification of adult flies the following ten dipteran fly species belonging to six families were recorded as myiasis causing on the basis of reported cases in Saudi Arabia (Table.3). The flies collected during survey were *Megaselia scalaris*, *Musca domestica*, *Fanniia canicularis*, *Sarcophaga haemorrhoidalis* (*Bercaea cruentata*); *Parasarcophaga ruficornis*, *Wohlfahrtia nuba*, *Chrysomya marginalis*, *chrysomya albicep*, *Chrysomya megacephala*,

Table 1. Showing the approved Abattoirs in Jeddah

| Municipality | District | Geographic coordinates | |
|--------------|--------------|------------------------|----------|
| UmElsalam | Al-nakheel | 39.25935 | 21.52699 |
| Al- janoub | Al- khumra | 39.22224 | 21.38080 |
| Abhor | Al- nahda 1 | 39.13383 | 21.60995 |
| Al- balad | Al- sabeel 1 | 39.20245 | 21.48317 |
| Al -matar | Al- nozha 3 | 39.18270 | 21.62562 |

Table 2. Showing total number of flies and their percentage collected from different locations

| Family Name | Species Name | Abattoirs Collection | Animal farm Collection | Fish & veg. Market Collection | Animal Carcases Collection | Total No. Of flies | Total percentage |
|---------------|-----------------------------------|----------------------|------------------------|-------------------------------|----------------------------|--------------------|------------------|
| Phoridae | <i>Megasellia scalaris</i> | 56 | 62 | 6 | 82 | 206 | 7.721% |
| Muscidae | <i>Musca domestica</i> | 980 | 766 | 32 | 26 | 1804 | 67.616% |
| Fanniidae | <i>Fannia canicularis</i> | 18 | 11 | 6 | 0 | 35 | 1.311% |
| Sarcophagidae | <i>Sarcophaga haemorrhoidalis</i> | 106 | 15 | 59 | 53 | 233 | 8.733% |
| Sarcophagidae | <i>Parasarcophaga ruficornis</i> | 18 | 10 | 4 | 5 | 37 | 1.386% |
| Sarcophagidae | <i>Wohlfahrtia nuba</i> | 14 | 5 | 8 | 4 | 31 | 1.161% |
| Calliphoridae | <i>Chrysomya albiceps</i> | 120 | 49 | 79 | 28 | 276 | 10.344% |
| Calliphoridae | <i>Chrysomya megacephala</i> | 6 | 3 | 2 | 1 | 12 | 0.449% |
| Calliphoridae | <i>Chrysomya marginalis</i> | 13 | 6 | 4 | 3 | 26 | 0.974% |
| Oestridae | <i>Oestrus ovis</i> | 3 | 5 | 0 | 0 | 8 | 0.299% |
| TOTAL | | 1334 | 932 | 200 | 202 | 2668 | |
| Percentage | | 50% | 34.93% | 7.50% | 7.57% | | |

and *Oesteris ovis*. The present prevalence of each fly species was recorded (Table.2). The highest prevalence was recorded for the common house fly *Musca domestica* (67.6%). Most of the species were collected from slaughter houses (50%) and animal farms (39%). (Table.2).

Following are the salient morphological diagnostic characteristics and habitats of the species collected.

Family: Phoridae

Megasellia scalaris (Loew, 1866) (Coffin fly or scuttle fly)

Brownish small fly which is also named as scuttle fly due to its sudden and rapid movements. The adult fly may be easily recognised by “humpbacked” thorax and laterally compressed hind femur. The fore margins of the wings are thickened, wing veins are parallel to each other and without cross veins. One segmented antenna with long arista.

The fly maggots are found near rotten meat, vegetable remains, trash containers, abattoirs, over animal carcasses and near poor sanitary conditions. (it causes human accidental myiasis in wounds, intestine, eyes, respiratory system and urino-genital system).

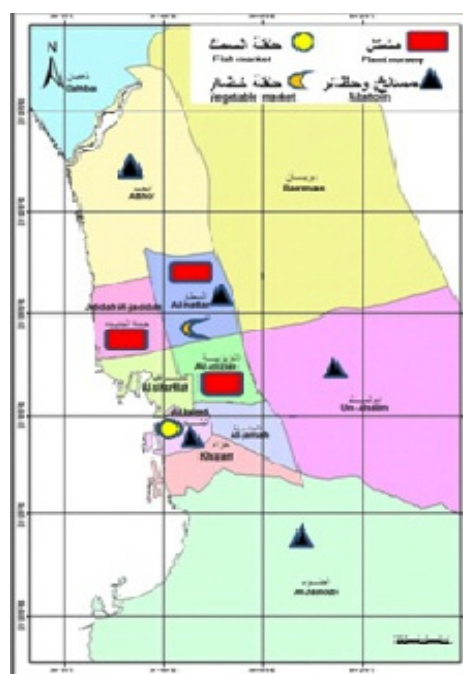


Fig.1. A map of Jeddah city showing different locations of Flies collection

Table 3. Cases of human and animal myiasis recorded from Saudi Arabia

| IN HUMANS Family | Species | Type of Myiasis | Reported By | Region |
|---------------------|---------------------------------|---------------------|---|--------------------------|
| Phoridae | <i>Megaselliascalaris</i> | Urinary | Wakid, MH 2008 | Jeddah |
| Sarcophagidae | <i>Wohlfahrtia magnifica</i> | Aural Scalp | Al Jbari, I 2015 Al Badri et al 2016 | Al Ahsa |
| Sarcophagidae | <i>Sarcophaga</i> sps. | Open Diabetic wound | Zaglool et al 2013 | Makkah |
| Calliphoridae | <i>Cardylobia anthropophaga</i> | Cutaneous | Omar & Abdallah 1992 Afifi et al 2015 | Al Asir Al Baha |
| Oestridae | <i>Dermatobia hominis</i> | Cutaneous | Al Otaibi 2016 Akhtar et al 2000 Hiba Radwan 2015 | Al Khobar Al Asir Taif |
| Oestridae | <i>Ostris ovis</i> | Ophthalmomyiasis | Kenway et al. 2014 | Al Asir |
| IN ANIMALS | | | | |
| Oestridae | <i>Ostris ovis</i> | Nasopharyngeal | Al Ahmad et al. 2000 Banja & Madbouly 1981 Bosly 2013 | Riyadh West Jazan |
| Oestridae | <i>Cephalopina titillator</i> | Nasopharyngeal | Fatani & Hilali 1994 Ghandour, 1988 Banja & Madbouly 1981 Buttiker & Zumpt 1982 | Al Ahsa West West Riyadh |
| Calliphoridae | <i>Chrysomya bezziana</i> | Dermal | Al Ahmad et al 2001, 2006 | Riyadh |
| Calliphoridae | <i>Chrysomya albiceps</i> | Dermal | Al Ahmad 2001 | Riyadh |
| Calliphoridae | <i>Chrysomya megacephala</i> | Dermal | Ramdan & El Bihari 1980 | Hafuf |
| Sarcophagidae | <i>Wohlfahrtia magnifica</i> | Dermal | Al Ahmad 2001 | Riyadh |

Family: Muscidae***Musca domestica* (Linnaeus, 1758) (House fly)**

Thorax with 4 black stripes on greyish background, abdomen with yellowish spots on the anterior lateral sides below the wings and a dark midline. Antennae are short and 3 segmented, anal cell in the wing is closed, 4th vein angled with discal cell.

It lives close to humans and contaminate the food, feed and breed in garbage and animal faeces. (It is an agent of accidental myiasis of intestine and urino-genital system).

Family: Fanniidae***Fannia canicularis* (Linnaeus, 1761) (Lesser house fly)**

The thorax is brown-grey with less distinct three black brown stripes, abdomen yellow in colour, eyes are with white border in male, head silvery in colour, halteres are yellowish, the 4th vein not angled but straight, anal vein short.

High number of *Fannia* found in poultry farms and animal sheds. Deposit eggs on decaying organic matter such as cow dung, human and poultry faeces.

(It causes accidental myiasis of intestine and urino-genital system)

Family: Sarcophagidae***Sarcophaga haemorrhoidalis* (Fallen, 1817) (red-tailed flesh fly)**

Thorax with 3 dark longitudinal stripes, antennal arista is plumose at the base and bare at the tip; antenna and palpi are greyish black with white hair on gennae. Abdomen with grey black checker board. Sixth tergite of female is red in

colour, separated with a row of strong bristles at the edge.

Flesh flies usually attracted to rotten meat, fish, vegetables, colonize the corpses, animal and human faeces.

Larviparous (Lay larvae) (Produce myiasis on necrotic or dead flesh in both humans and animals.).

***Parasarcophaga ruficornis* (Fabricius, 1794) (flesh fly species)**

Can be identified by white hairs on gennae below eyes, antenna and palpi orange in colour. Breed both in faeces and dead bodies.

(breeds on flesh causing myiasis or carrion and faeces, also a vector for diseases).

***Wohlfahrtia nuba* (Wiedemann, 1830) (spotted flesh fly)**

Greyish with three black round spots at the end of each abdominal segment, antennal arista bare or with very short hairs, larviparous. Breed on the open wounds of the camel and causes severe myiasis.

(Causes severe myiasis in Camel it is a secondary invader of wounds.)

Family: Calliphoridae***Chrysomya albiceps* (Wiedemann, 1819) (Blow fly species)**

Body metallic green with narrow dark lines on the rear edge of each abdominal segment; anterior thoracic spiracle white/pale yellow, antennal arista plumose, head with silvery hair.

(Female deposit egg on the decomposing tissues or in the wounds of living in animals and in



Fig. 2. Myiasis in a sheep



Fig. 3. Myiasis in Human

humans and causes a specific myiasis in wounds, sores and nasal cavities.)

***Chrysomya megacephala* (Fabricius, 1794)**
(oriental latrine fly)

Large red eyes with metallic blue/green body, buccal area and gennae with orange setae. Anterior thoracic spiracle black/brown. Lower

calypter white at the base and the rest is dark.

(Causes myiasis in animals and humans resulting into economic losses in cattle and fish industries all over the world.)

***Chrysomya marginalis* (Wiedemann, 1830)**

Anterior wing margins dark, anterior spiracle white in colour. Greater ampulla with thick

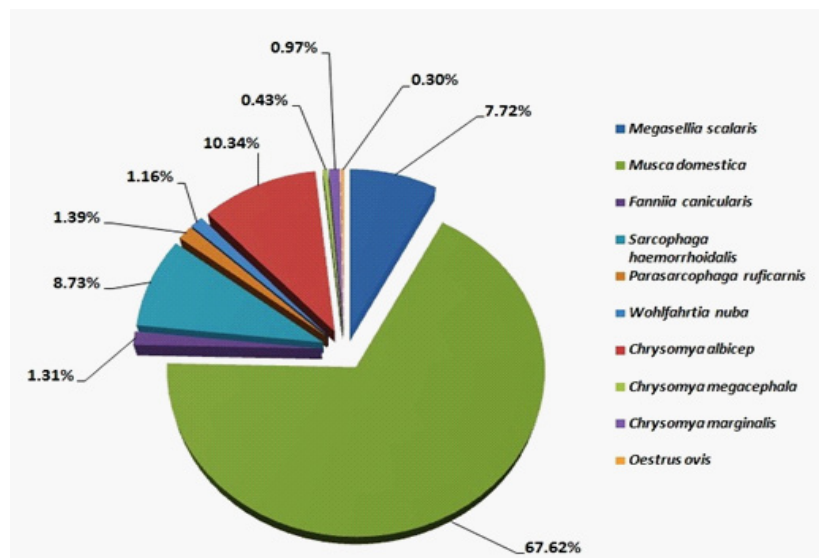


Fig. 4. Percent variation in the population density of adult flies causing myiasis in Jeddah

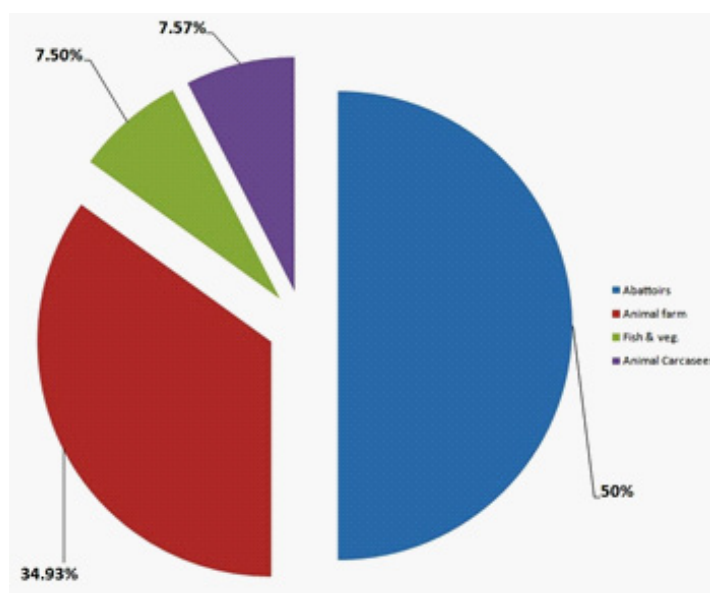


Fig. 5. Percentage of flies causing myiasis collected from different locations of Jeddah

hairs dorsally. Lower calypter with dense hairs.

Family: Oestridae

***Oestrus ovis* (Linnaeus, 1758) (Sheep nasal bot fly)**

Short stout and dark grey body with black spots at the abdomen. Head and legs are dull yellow.

Female fly deposit eggs in the nostrils of the camel or sheep. Usually found where sheep camel or goats are reared.

(Responsible for myiasis of skin, mucous membranes of mouth, eyes or nasal cavities both in animals and humans.)

Most of the reports on myiasis in animals & humans from Saudi Arabia are about the case studies. (Afifi et al, 2015; Al Otaibi et al. 2016; Al Badri, 2016; Al Ahmad et al, 2006;). Many myiasis causing flies collected by different workers from other parts of the country such as, *Cordylobia anthropophaga*, *Dermatobia hominis*, *Wohlfahrtia magnifica*, *Cephalopina titillator*, *Chrysomya bezziana* etc., may be present in Jeddah region but could not be trapped during this study. Some of the workers studied the identification of forensic important flies from Jeddah (Al Ghamdi and Alikhan, 2015, Al shareef H. 2016) but there is no record of myiasis causing flies from this region.

CONCLUSION

Present study is important because it provides a list of flies causing myiasis to animals and humans in this part of the kingdom and responsible for the economic losses and agony. The flies may be different taxonomically but they affect animals and humans in the same way and their ecology and habitats also similar.

The easy method of identification is needed for the veterinary & health workers to control the myiasis causing flies and to reduce the economic loss and human sufferings.

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