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ORIGINAL ARTICLE

Prevalence of ectoparasites in free-range backyard chickens, domestic pigeons (*Columba livia domestica*) and turkeys of Kermanshah province, west of Iran

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Abstract This study was carried out on free-range backyard chickens, domestic pigeons (*Columba livia domestica*) and turkeys from May 2012 to April 2013 to determine the prevalence and identify the species of ectoparasites in Kermanshah province, west of Iran. Of the total of 600 free-range backyard chickens (185 ♂ and 415 ♀), 700 domestic pigeons (278 ♂ and 422 ♀) and 150 turkeys (53 ♂ and 97 ♀), 389 (64.83 %), 608 (86.85 %) and 54 (36 %) were infected with one or more parasites respectively. Eleven ectoparasites species including five of lice (50.16 % *Menacanthus stramineus*, 13.66 % *Menopon gallinae*, 4.83 % *Cuclotogaster heterographus*, 5.16 % *Goniocotes gallinae*, 2.33 % *Goniodes gigas*), three of mites (26.33 % *Dermanyssus gallinae*, 8.5 % *Ornithonyssus bursa*, 7 % *Cnemidocoptes mutans*), one of tick (78.66 % *Argas persicus*) and two of flea (12.33 % *Echidnophaga gallinacea*, 2 % *Pulex irritans*) were found in the backyard chickens. The domestic pigeons were infected with six species of parasites including: *Columbicola columbae* (61.7 %), *M. gallinae* (10.43 %), *M. stramineus* (9 %), *D. gallinae* (8.28 %), *Argas reflexus* (74.14 %) and *Pseudolynchia canariensis* (27.7 %). The ectoparasites species recorded in turkeys were *M. gallinae* (14 %), *M. stramineus* (8 %), *D. gallinae* (12.66 %), *C. mutans* (6 %), *A. persicus* (24.66 %) and *E. gallinacean* (6 %). This is the first survey to determine the prevalence and identify the species of ectoparasites among free-range backyard chicken, domestic pigeons and turkeys in Kermanshah province. The high prevalence rate of ectoparasites in free-range backyard chickens and domestic pigeons indicates that parasitic infection is a common problem in this area.

Keywords Prevalence · Ectoparasites · Chickens · Domestic pigeons · Turkeys · Kermanshah

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Introduction

Indigenous fowl reared under traditional extensive (rural scavenging) system or improved traditional (semi-scavenging) production system constitutes one of the important components of the nutritional status and income of many smallholder farmers and landless communities (Maqbool et al. 1998; Permin et al. 2002; Muchadeyi et al. 2004). Compared to a number of other livestock species, fewer social and religious taboos are related to the production, marketing and consumption of poultry products. For these reasons, poultry products have become one of the most important protein sources for man throughout the world (Radfar et al. 2012). In addition, Village fowl play an active role in pest control and are used for traditional ceremonies and festivals (Kelly et al. 1994; Muchadeyi et al. 2004).

Traditional poultry production is often described as a low input/low output system. The low productivity is mainly caused by diseases, suboptimal management and lack of supplementary feed (McAinsh et al. 2004; Muchadeyi et al. 2004).

Parasitic infections are ubiquitous and high infection load results in clinical disease. Hundreds of parasite species have been identified from free-ranging birds. Birds are definitive hosts, paratenic or transport hosts for ectoparasites (Ectoparasites can be broadly divided into mites, lice, ticks, fleas, and flies) (Edosomwan and Amadasun 2008). Ectoparasites are regarded as the basic causes of retardation in growth, lowered vitality and poor conditions of the birds. They can affect bird health directly by causing irritation, discomfort, tissue damage, blood loss, toxicosis, allergies and dermatitis, which in turn alleviate quality and quantity of meat and egg production (Ruff 1999). Moreover, some of the ectoparasites, especially tick and mites, are vectors of other poultry diseases such as Pastuerellosis, Fowl Pox, Newcastle disease, and possibly chlamydia (Nnadi and George 2010).

In addition to chickens, pigeons and turkeys can be reservoirs for a number of parasitic infections and transmit their parasites to other birds. Native fowls parasitic infections constitute health and economic problems as well as sources of infection for industrial poultry, wild birds and man (Eslami et al. 2009).

The present study was undertaken with the objectives of determining the prevalence rates of ectoparasites and their species in free-range backyard chickens as well as domestic pigeons and turkeys in Kermanshah province, Iran.

Materials and methods

Field study area

This study was conducted on free-range backyard chickens, pigeons (*Columba livia domestica*) and turkeys obtained from in and around two selected areas of Kermanshah (Ghilanegharb and Kermanshah County), the western province of Iran, from May 2012 to April 2013 during the wet and dry seasons. Kermanshah province is located between latitude 33°35′ N and longitude 45°47′ E with altitude 1,350 m above sea level. Kermanshah has a moderate and mountainous climate and the annual rainfall is 500 mm. The average temperature in the hottest months is above 22 °C.

Sample size and sampling procedure

A total of 600 backyard chickens, 700 pigeons and150 turkeys of different age and sex groups were randomly selected from the area under study. The birds 2–8 months old were considered to be "young"; those older were considered to be "adult". The head, combs, eyelids, wattles, neck, feathers, breast, back, wings, shafts, legs and other external surfaces of the chicken were thoroughly examined.

Parasitological examinations

The plumage of each bird was thoroughly brushed onto a white tray for the collection of ectoparasites. The feathers of the head, neck, wings, body, legs and cloaca were raised and thoroughly examined with a hand lens for ectoparasites. Attached ectoparasites such as lice and ticks, which could not be removed by brushing, were gently dislodged with a pair of thumb forceps and their sites noted. In birds suspected to infestation with mites, deep scrapings were collected by using a scalpel or knife blade dipped in acetic glycerine (1 % glacial acetic acid in glycerine). All types of ectoparasites collected were categorized. Permanent preparations were made and then the slides were identified on the basis of their morphological characters as per Fabiyi (1980) and Soulsby (1982). The data collected was stored and descriptive statistics was done using SPSS software, version 16.

Results

Of the total of 600 free-range backyard chickens (185 ♂ and 415 ♀), 700 domestic pigeons (278 ♂ and 422 ♀) and 150 turkeys (53 ♂ and 97 ♀), 389 (64.83 %), 608 (86.85 %) and 54 (36 %) were infected with one or more ectoparasites respectively (Tables 1).

The ectoparasites fauna of examined local birds during this study was marked by the presence of six species of lice (*Menacanthus stramineus, Menopon gallinae, Cuclotogaster heterographus, Goniodes gigas, Goniocotes gallinae, Columbicola columbae*), three species of mites (*Dermanyssus gallinae, Cnemidocoptes mutans, Ornithonyssus bursa*), two tick species (*Argas reflexus* and *Argas persicus*), two flea species (*Pulex irritans, Echidnophaga gallinacean*) and one fly species (*pseudolynchia canariensis*) (Table 1).

Lice infestation

Of the total 600 backyard chickens examined, 64.83 % were infected with lice. The fauna of lice infestations of chickens generally revealed five major species namely *M. stramineus, M. gallinae, C. heterographus, G. gigas* and *G. gallinae*. Among the identified lice species, *M. stramineus* was the most prevalent (50.16 %) species followed by *M. gallinae* (13.66 %) and *C. heterographus* (4.83 %). 72.57 % of domestic pigeons were infected with three species of lice including *C. columbae, M. gallinae* and *M. stramineus*. Among these species, *C. columbae* was found to be most prevalent with an overall prevalence of 61.7 %. Out of the 150 turkeys examined, 18 % had lice infestation.

Table 1 The prevalence of ectoparasites infestation in free-range backyard chickens, domestic pigeons (*Columba livia domestica*) and turkeys in Kermanshah province, west of Iran

Ectoparasites	Male			Female			Overall
	Young	Adult	Both	Young	Adult	Both	
Backyard chickens							
Lice							
M. stramineus	82 (71.3 %)	132 (44 %)	214 (51.56 %)	50 (58.82 %)	35 (35 %)	87 (47.03 %)	301 (50.16 %)
M. gallinae	13 (15.29 %)	13 (13 %)	26 (14.05 %)	22 (19.33 %)	34 (11.33 %)	56 (13.49 %)	82 (13.66 %)
C. heterographus	6 (7.05 %)	4 (4 %)	10 (5.4 %)	7 (6.08 %)	12 (4 %)	19 (4.58 %)	33 (4.83 %)
G. gigas	2 (2.35 %)	2 (2 %)	4 (2.16 %)	4 (3.47 %)	6 (2 %)	10 (2.41 %)	14 (2.33 %)
G. gallinae	5 (6.09 %)	6 (6 %)	11 (5.94 %)	7 (6.08 %)	13 (4.33 %)	20 (4.82 %)	31 (5.16 %)
Mite							
D. gallinae	22 (25.88 %)	25 (25 %)	47 (25.4 %)	38 (33.04 %)	73 (24.33 %)	111 (26.74 %)	158 (26.33 %)
C. mutans	0	7 (3.78 %)	7 (3.78 %)	0	35 (8.43 %)	35 (8.43 %)	42 (7 %)
O. bursa	5 (5.88 %)	8 (8 %)	13 (7.02 %)	11 (9.5 %)	27 (9 %)	38 (26.74 %)	51 (8.5 %)
Tick							
A. persicus	43 (50.58 %)	68 (68 %)	111 (60 %)	72 (62.6 %)	289 (96.3 %)	361 (89.98 %)	472 (78.66 %)
Flea							
P. irritans	1 (0.85 %)	2 (2 %)	3 (1.62 %)	3 (2.6 %)	6 (2 %)	9 (2.16 %)	12 (2 %)
E. gallinacea	12 (14.1 %)	14 (14 %)	26 (14.05 %)	18 (15.62 %)	30 (10 %)	48 (11.56 %)	74 (12.33 %)
Pigeons							
Lice							
C. columbae	28 (70 %)	121 (50.84 %)	149 (53.59 %)	49 (53.59 %)	232 (67.63 %)	281 (66.58 %)	432 (61.7 %)
M. gallinae	6 (15 %)	25 (10.5 %)	31 (11.15 %)	9 (11.39 %)	33 (9.62 %)	42 (9.95 %)	73 (10.43 %)
M. stramineus	6 (15 %)	17 (70 %)	23 (8.27 %)	10 (12.65 %)	30 (8.74 %)	40 (9.47 %)	63 (9 %)
Mite							
D. gallinae	4 (10 %)	11 (4.62 %)	15 (5.4 %)	11 (13.9 %)	32 (9.32 %)	43 (10.1 %)	58 (8.28 %)
Tick							
A. reflexus	28 (70 %)	149 (62.6 %)	177 (63.66 %)	54 (68.35 %)	288 (83.96 %)	342 (81.04 %)	519 (74.14 %)
Flies							
P. canariensis	11 (27.5 %)	41 (25.6 %)	72 (25.9 %)	23 (29.11 %)	99 (28.86 %)	122 (28.9 %)	194 (27.7 %)
Turkeys							
Lice							
M. gallinae	2 (18.13 %)	5 (11.9 %)	7 (13.2 %)	4 (17.39 %)	10 (13.5 %)	14 (14.43 %)	21 (14 %)
M. stramineus	1 (9.09 %)	4 (9.52 %)	5 (9.4 %)	2 (8.69 %)	5 (6.75 %)	7 (7.2 %)	12 (8 %)
Mite							
D. gallinae	3 (27.27 %)	4 (9.5 %)	7 (13.27 %)	4 (17.39 %)	8 (10.8 %)	12 (12.37 %)	19 (12.66 %)
C. mutans	0	3 (5.66 %)	3 (5.66 %)	0	6 (6.18 %)	6 (6.18 %)	9 (6 %)
Tick							
A. persicus	4 (36.36 %)	11 (26.19 %)	15 (28.3 %)	7 (30.43 %)	15 (20.27 %)	22 (22.68 %)	37 (24.66 %)
Flea							
E. gallinacea	1 (9.09 %)	2 (4.76 %)	3 (5.66 %)	2 (8.69 %)	4 (5.4 %)	6 (6.18 %)	9 (6 %)

M. gallinae with an overall prevalence of 14 % was found to be most prevalent lice in turkeys.

Mite infestation

The highest prevalence of mites was recorded in backyard chickens with a prevalence of 33.5 % (201 of 600) followed by turkeys 18.66 % (28 of 150) and pigeons 8.28 % (58 of 700). Backyard chickens were infected with three species of mites including *D. gallinae* (26.33 %), *O. bursa* (8.5 %) and *C. mutans* (7 %). Among the pigeons, frequency of infection to *D. gallinae* (only identified mite) was 8.28 %. The species of mites in turkeys were *D. gallinae* and *C. mutans* with an overall prevalence of 12.66 and 6 %, respectively.

Tick infestation

Among birds examined, 78.66 % of backyard chickens, 74.14 % pigeons and 24.66 % of turkeys were found positive for tick species. *A. persicus* in chickens and turkeys and *A. reflexus* in pigeons were only identified tick in this study.

Flea infestation

Out of the 600 backyard chickens and 150 turkeys examined, 84 (14) and 9 (6 %) had a flea infestation respectively. Among the identified flea species, *E. gallinacean* was the most prevalent (12.33 %) species followed by *P. irritans* (2 %) in chickens and *E. gallinacean* with an overall prevalence of 6 % only identified flea in turkeys.

Discussion

The overall prevalence rate of parasites in free-range backyard chickens and domestic pigeons was considerably higher, which indicates that parasitic infection is a common problem in this area. Similar observations of high prevalence of ectoparasites in chicken have been reported in tropical African countries such as Nigeria (Fabiyi 1996; Sadiq et al. 2003), Ethiopia (Abebe et al. 1997), Zimbabwe (Permin et al. 2002), Malawi (Njunga 2003), Kenya (Mungube et al. 2008), Poland (Cencek 2003), Romania (Magdas et al. 2006), Sweden (Höglund et al. 1995), northeastern Iran (Razmi et al. 2008) and northern West Bank, Palestine (Othman et al. 2012). This high prevalence of ectoparasitism may be associated partly with the poor hygienic practice in the backyard management system, which creates a conducive environment for the propagation and life cycle progression of the diverse parasitic fauna in the studied area. The high parasitic fauna has direct or indirect effects on the productivity of local chickens.

The lice identified during this study include: *M. stramineus, M. gallinae, C. heterographus, G. gigas, G. gallinae, C. columbae*. The predominant louse identified in this study was *M. stramineus* (50.16 %) in backyard chickens. This louse is the most pathogenic species of poultry lice as it causes severe anemia by feeding on blood that oozes out. It also results in inflammation of the skin and the extensive scab formation and eventually feathers loss (Ashenafi 2000). However, this figure is lower than previous reports in central Ethiopia and Kashmir (Bersabeh 1999; Ashenafi 2000; Helina 2000), but it is higher than the reports of Abede et al. (1997) and Tolossa et al. (2009) in Dire Dawa, in and around Addis Ababa (26.6 %) and Oromia regional state (40 %) respectively. Among the lice species observed, *C. columbae* had the highest prevalence (61.7 %) in domestic pigeons and followed by *M. gallinae* (10.43 %) in domestic pigeons. According to Harlin (1994), *C. columbae* is the most common malophagian parasite of pigeons. The rate of infestation with *C. columbae* in this study is higher than the reports of Harlin (1994) and Radfar et al. (2009).

The highest prevalence of mites was recorded in backyard chickens with a prevalence of 33.5 % (201 of 600). *D. gallinae* was the most prevalent species with an overall prevalence of 26.33, 8.28 and 12.66 % in backyard chickens, pigeons and turkeys, respectively. This finding was not in agreement with those reported from Poland with 100 % (Cencek 2003), 39.3 and 43.45 % in central and northeastern Iran (Razmi et al. 2008; Yakhchali et al. 2013), 60 % in Romania (Magdas et al. 2006), 67 % in Sweden (Höglund et al. 1995) and 30.7 % in northern West Bank, Palestine (Othman et al. 2012). These variations in the prevalence may be due to different factors such as farm sizes, endemic situation and bad hygiene practices (Yakhchali et al. 2013).

D. gallinae is a blood feeder and is responsible for egg downgrading and spotting, anemia in birds and more reports suggest it could have a vector role in several animal diseases. An increase in the prevalence rates of mites could also have an epidemiological impact on human and veterinarian diseases as the risks of *D. gallinae* transmitting more pathogens would increase as well (Sparagano et al. 2009).

In this study, *A. persicus* in chickens and turkeys and *A. reflexus* in pigeons with an overall prevalence of 78.66, 74.14 and 24.66 % respectively were only identified tick. It is usually difficult to report the actual prevalence rates of *A. persicus* and mites because they commonly visit briefly the host for blood meal usually at night. Ticks transmit bacterial, rickettsial, viral, and parasitic and spirochaetal diseases in poultry (Haider Shah et al. 2004). Heavy infections with *Argas* spp. can cause blood loss leading to anemia and eventually death. Also, *A. persicus* is probably a limiting factor of a successful production in the tropical and subtropical area (especially due to its role as vector of *Aegyptinella* spp. and *B. anserine*) (Permin et al. 2002).

A. persicus and *D. gallinae* are reported either to infest man or cause annoyance, especially in rural areas where there is a close association between man and domestic fowls. *A. persicus* is known to infest man especially children (Sadiq et al. 2003). Also, *A. reflexus* bites people as a substitute host when pigeons are not available (Hilger et al. 2005) causing not only skin irritations and pathogen transmission (Haag-Wackernagel and Moch 2004), but also a variety of symptoms corresponding to an IgE-mediated allergy with increasing severity resulting in death (Weckesser et al. 2010).

Among the identified flea species, *E. gallinacean* was the most prevalent (12.33 %) species followed by *P. irritans* (2 %) in backyard chickens and *E. gallinacean* with an overall prevalence of 6 % only identified flea in turkeys.

The tropical chicken flea or stick-tight flea (*E. gallinacea*) which attaches to the combs, wattles and around the eyelids, induce irritation, restlessness and anemia by their biting and sucking activities, and affected chickens may become blind when their nictitating membranes are damaged (Soulsby 1982).

The prevalence of *E. gallinacea* in this study was not in agreement with those reported from Ethiopia with 51.3 (Belihu et al. 2009) and 77.4 % in Nigeria (Ikpeze et al. 2008). In this study, *E. gallinacean* was not found in the pigeons similar to the other reports (Dranzoa et al. 1999; Adang et al. 2009; Msoffe et al. 2012; Radfar et al. 2012); however Begum and Sehrin (2011) isolated this parasite from 8.33 % of examined pigeons.

Generally, fourteen species of ectoparasites were identified in the present study indicating the existence of diverse ectoparasite fauna in the study area. The current study indicates that free-range backyard chickens, domestic pigeons and turkeys are considered as potential reservoirs for parasite infections and this poses a risk of contamination for modern chicken farms. Therefore, further studies are needed to elucidate the economic and hygiene impacts of multiple parasitic infections on poultry reared in backyard system.

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