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ORIGINAL ARTICLE

Survey of External parasites of House sparrows (*Passer domesticus*) in Hail Region, Saudi Arabia

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ABSTRACT
Many species of birds have been remarked to have a commensal relationship with humans. Many were reported as vectors for many parasites, fungi and bacteria. The current study was designed to investigate the prevalence and intensity of external parasites on male and female house sparrows spreading across farm landscape of Hail region (Saudi Arabia). Number of 58 birds were captured using mist nets allocated in different farms North of Hail area. Birds were examined for infestation with external parasites by using the body washing method. Obtained results has revealed two species of arthropods; Dermanyssus gallinae and Columbicola columbae with total infestation of 29.31% (17.24% in males and 12.07% in females). Infection with D. gallinae was significantly higher than C. columbae, 24.14% and 05.17, respectively. 15.52% of the infection with D. gallinae was recorded in males, meanwhile 08.62% in females. 03.45% of the infestation with C. columbae was recorded in females, meanwhile 01.72% in males. Comparison of the total number of parasites recovered revealed significant difference between the two parasites, 96.51% for D. gallinae and 03.49% for C. columbae. Moreover, the intensity of infestation (the number of parasites per one bird) with D. gallinae was 7.33 for male birds and 3.4 for females; meanwhile for C. columbae was 01.00 for both males and females.
Key words: House sparrows - External parasites - *Columbicola columbae Dermanyssus gallinae*

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INTRODUCTION

Birds have been known for their epidemiological role as potential carriers and reservoir of zoonotic parasites and many pathogenic organisms [1]. The house sparrow (*Passer domesticus*) is a wide spreading species across North Africa, South America, Australia, New Zealand and many of the Pacific Islands [2]. It is also common in rural and urban areas in close association with man and livestock. As a consequence, sparrows have been linked in the spread of numerous diseases of humans and their domesticated animals [3,4,5]. There are some suggestions that sparrows have been involved in the transmission of introduced avian diseases that have led to the extinction or endangerment of native species [6, 7].

Since the house sparrow has strong commensal relation with humans and easily adapted to urban and rural areas, the investigation of external parasites infestation is one of the effective methods to explore their role and capacity in the epidemiology of some parasitic diseases of human and livestock importance. Moreover, external parasites have serious effects on the biological performance of infected birds that would - undoubtedly- affect their population dynamics. Many studies on prevalence and effects of external parasites on passeriform birds were reported. For example, investigation of the relationships between behavioral variables (dominance, grooming) and ectoparasites [8]. Investigation of the haematological responses to bloodsucking mite infection and effects on growth and fledging success of nestling [9]. Studying the effect of the white wing-stripe of male *Passer domesticus* as an indicator of the load of Mallophaga [10]. Examination of the relationship between uropygial gland size and feather mite abundance in *Passer domesticus* [11]. Investigation of the parasitic cheyletoid mites associated with passeriform birds (Aves: Passeriformes) [12]. Examination of sex ratio and sexual dimorphism of three lice species parasitizing the house sparrow were studied [13].

The objective of the present study was to investigate the prevalence and intensity of external parasites on male and female house sparrows from Hail region (Saudi Arabia).

MATERIALS AND METHODS

Study area

Hail region is located in north western Saudi Arabia. It is characterized by diverse natural habitats and topographic landscapes. These kinds of characteristics make Hail an attractant site for many migratory bird species. The current study was conducted at El-Khuta area, which lies 3240900N, 4650E 3250800N, 46700E northern of Hail City, Saudi Arabia (Figure **1**). It is a town that consists of mixed large scale of farms. Our field study targeted a large Diary Project in this town with mixed crop farms, large stock of Holstein cows enclosures, and open granaries, which represents a flourishing habitat for sparrows to breed and disperse freely.

Figure 1: An ArcGIS map showing the study area.
Caption: Source map: ESRI 2011. ArcGIS Desktop: Release 10.1 Redlands, CA: Environmental Systems Research Institute.

Sampling of birds and ethics statement

Field sampling was conducted during the period April-June 2016 in strict accordance with the recommendations and approval of the University Committee on Use and Care of Animals at the University of Hail. Mist nets were allocated in different sites across the farm, where two nets assembled in granaries, two in open field and, two nets around cow's enclosures. All birds were immediately removed from mist nets, handled for less than 10 minutes, and all efforts were made to minimize suffering. Each captured bird was kept separately in an appropriate pored plastic bag to prevent transfer of external parasites between individuals. Birds were transferred to the laboratory for examination of their natural infestation with external parasites.

Collection and examination of external parasites

Birds were anesthetized by chloroform inhalation. The body washing method was used for the collection of external parasites[14]. Each bird was immersed in 500 ml 1% soap solution in a plastic container. The plastic containers were then sealed and put in an electric shaker (GFL 3033,GERMANY). After continuous shaking for two hours using 50 rpm speed, each bird was then removed and inspected with a hand magnifying lens. Each soap solution was passed through a Whatman filter paper embedded in a Buchner funnel fitted to a vacuum filtration pump (Rocker 400, TAIWAN). Each filter paper was gently removed from the Buchner funnel and the content was gently washed in a Perti dish. The Petri dishes were then investigated under a dissecting microscope, and the external parasites found were identified [15, 16].

Statistical analysis

Microsoft Excel program was used to calculate the percentage of prevalence and the mean intensity of parasites. Moreover, the student *t*-test (α=5) was used to show statistical significance of difference.

RESULTS AND DISCUSSION

Species and percentage of external parasites recovered

Two species of arthropods were reported as external parasites; *D. gallinae* mites that belong to the family Dermanyssidae, and *C. columbae* lice that belong to the family Philopteridae. *D. gallinae* - known as red chicken mite - is a cosmopolitan ectoparasite haematophagous mite of fowl, pigeon, canary, other wild and domestic birds, and also some species of mammals[15,17]. *D. gallinae* were reported as common ectoparasites of house sparrows[8,9]. The parasite is nocturnal, hiding by day in crevices near roosting places and emerging at night to feed on blood[16]. *C. columbae* - known as the pigeon or turkey slender louse - is an exclusively keratin feeder chewing lice. The parasite mostly feeds on the barbules of feathers, skin scurf, epidermal scales, sheaths of growing feathers, and pellicle of skin, but not on blood [16, 18].

With regard to overall infestation in sampled birds, the results revealed 29.31% infestation with both species (table 1).

Table 1: Prevalence of the parasites *D. gallinae* and *C. columbae* in house sparrows

Sex of bird	Number of birds investigated	Number and percentage (%) of birds infected	Number and percentage (%) of birds infected with *D. gallinae*	Number and percentage (%) of birds infected with *C. columbae*
Male	43	10(17.24)	9(15.52)	1(01.72)
female	15	7(12.07)	5(08.62)	2(03.45)
Total	58	17(29.31)	14(24.14)	3(05.17)

Infestation with *D. gallinae* was significantly higher than *C. columbae*. Definitely, this high infestation would have negative effects on many biological parameters of house sparrows, as parasites are ubiquitous organisms that obtain resources from their hosts for moult by juveniles and for reproduction by adults [19]. It is thus not surprising that most morphological, physiological, and behavioral aspects of the life history of hosts are believed to be affected by parasitism. Furthermore, high levels of parasitism may induce reduced body weight and size, or anaemia. Evidence for ectoparasitic effects on host's fitness and biological performance comes from numerous studies [9,10,19]. A decrease in the body mass of house sparrow due to high mite intensity was reported [20]. Conclusively, the outcome of the interaction between hosts and parasites seemed to be dependent on the genetic components of the two partners, as well as on the environmental parameters where they both live [5].

Prevalence and intensity of parasitism

Comparison of total number of parasites recovered from infested birds has revealed a significant difference, 96.51% for *D. gallinae* and 03.49% *C. columbae* (Figure 2). Regarding the intensity mean of infestation (figure 3), the number of *D. gallinae* per one infested bird was greater than that of *C. columbae*. Comparatively, consequences of infestation with *D. gallinae* and *C. columbae* should be viewed in relation

to the following points. Firstly, the former is a blood feeder parasite; meanwhile the latter never feeds on host blood. Secondly, *D. gallinae* was widely reported as being responsible for dermatological problems of varying severity in humans, especially children and poultry workers. Cases of human infestation have been reported in Denmark, France, Japan, Montenegro, Morocco, Norway, Serbia, the Netherlands, UK, Egypt, and Turkey[21,22]. Additionally, *D. gallinae* is a vector of *Borrelia anserrina,* Salmonella, Spirocheta, Ricketsia, and Pasteurella. The mite had been found naturally infected with the viruses of St. Louis encephalitis, eastern encephalitis, western encephalitis, and Q fever; and consequently it acts as a vector for these infections [15,16,23,24,25]. Meanwhile - far to our best knowledge - no documents that revealed *C. columbae* to infect humans or transmit pathogenic organisms. Unarguably, very heavy infestation of birds with *D. gallinae* may cause considerable loss of blood and ultimate death of host, compared to infestation with *C. columbae*, but the lesions made by the latter may cause significant blood loss and may provide a potential site for entry of other pathogens.

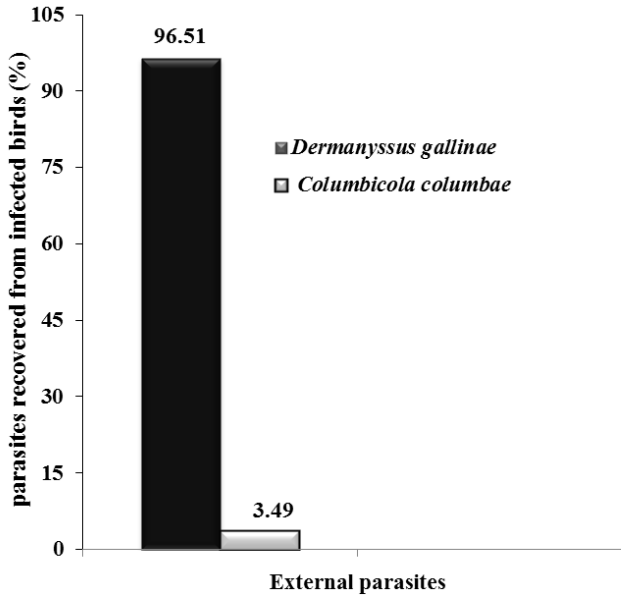

Figure 2: Percentage of *D. gallinae* and *C. columbae* parasites recovered from infested house sparrows.

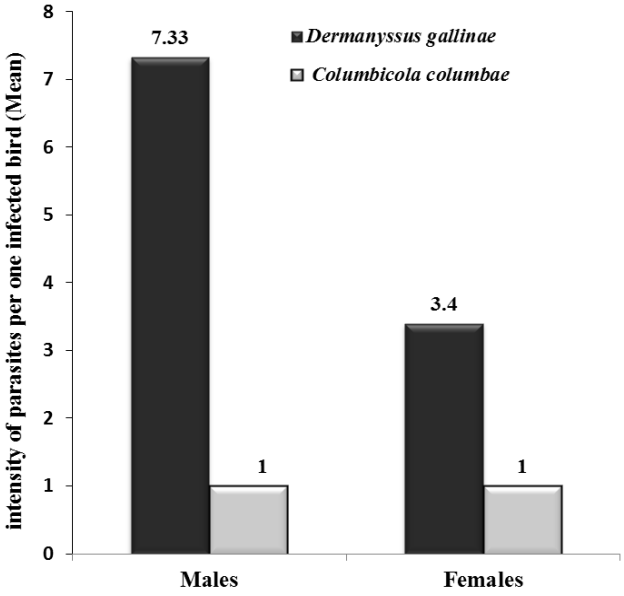

Figure 3: Intensity of *D. gallinae* and *C. columbae* parasites in infested house sparrows

Comparison of male and female birds infestation

Notably, as seen in table 1, male birds were significantly the most infested than females with regard to overall infestation, 17.24% and 12.07%, respectively.15.52% of the infestation with *D. gallinae* was significantly recorded in males, meanwhile 08.62% in females. 03.45% of the infestation with *C. columbae* was insignificantly recorded in females, meanwhile 01.72% in males. Additionally, individual male birds harbor more *D. gallinae* parasites compared to females (figure 3). This is well-evident in case of infestation with *D. gallinae*, which was statistically significant, but not in case of infestation with *C. columbae*. Probably, the number of *C. columbae* parasites recovered might had contributed to some results of being statistically non-significant, as there were only three parasites recovered. Anyhow, abundance of external parasites of birds varies greatly among individual hosts and species, as several environmental factors are suggested to limit the population size of external parasites on birds [11]. The significance of our results could be discussed on their importance in sexual selection for mating. Unequivocally, heavy infestation of male house sparrows with parasites is believed to affect some morphological traits that are very important for attraction of females to copulate, such as plumage color, wing stripe, black bib size, the size of the bursa of fabricius, etc. Moreover, these characters were supposed to be indicators of the resistance of males to parasites. Apparently, animals choose mates for genetic disease resistance by scrutiny of characters whose full expression is dependent on health and vigor [26,27].

On conclusion, as Hail area consists of suitable places which serve as important flyways and roosting sites such as mountains, different forms of seasonal valleys, open sand dunes and some spots of wetlands, and as *D. gallinae* in the absence of its definitive host occasionally attacks dogs, cats, rodents, horses and humans, causing dermatitis and intense pruritus, thus information on infestation of house sparrows with external parasites is very essential to explore their role in the epidemiology of some parasitic diseases. Moreover, such information would help health authorities to set ideal plans for control and management of parasitic diseases in such human agro-ecosystem.

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COMPETING INTERESTS

The authors have declared that no competing interest exists.

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