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Research Article

# Investigation of ectoparasites in budgerigar and canaries in Burdur city of Turkey

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**ABSTRACT**

Ectoparasite infestations are one of the most important but neglected diseases of birds. Ectoparasites cause sirious harmful effects such as; irritation, feathers and skin damage, restlessness, anemia, weight loss, transmission of other pathogens, reducing overall fitness and decreasing long term survival depending on the intensity of the infestation. This study was performed to investigate the ectoparasites of budgerigars and canaries in the center district of Burdur city, Turkey. For this purpose, we randomly selected 555 budgies from 192 cages and 121 canaries from 49 cages owned by 12 different breeders. The feathers of head, neck, abdomen, legs, tail, beak, under the wings, around the cloaca and feet of all birds, in addition cages and cage equipments were examined in terms of ectoparasite infestations. As a result; no ectoparasite species were found on/between feathers and other body parts of overall 676 cage birds, however, a large number of *Dermanyssus gallinae* were found in cages and cage equipments. *Dermanyssus gallinae* detected in rates of 28.65% and 28.57% in budgerigar and canary cages, respectively. The present study is the first investigation on ectoparasites of budgerigar and canaries in Turkey and rarely in the world. In addition, within this study, *D. gallinae* infestation was reported for the first time from budgerigar and canaries from Turkey.

## INTRODUCTION

The interaction between human and birds dates back many thousands years ago when people began to use these animals for meat, eggs, leather, feathers, bones, hunting or other purposes and today some species of birds continue to be a part of families as 'pets' in many countries in the world (Anderson, 2010). The 'pet bird' term is being used for birds housed and fed particularly for ornamental use, which can be classified mainly in two groups; Passeriformes (canaries, finches, mynah, sparrows, etc.) called songbirds and Psittaciformes (budgerigars, parakeets, parrots, etc.) (Boseret et al., 2013; Fard et al., 2020). Health and welfare of ornamental birds is especially essential because these animals have close bonds with humans (Anderson, 2010; Fard et al., 2020).

Ectoparasite infestations are one of the most important and neglected (Moller et al., 1990) diseases of the birds. Ectoparasites cause sirious harmful effects such as; irritation, feathers and skin damage, restlessness, anemia, weight loss, transmission of other pathogens, reducing overall fitness (nestling survival, reproductive success etc.) and decreasing long term survival depending on the intensity of the infestation (Moller and Lope, 1999; Kehlmaier and Quassier, 2013; Fard et al., 2020). As far as is known; several species of Acarina (mites), Ixodida (ticks), Phthyraptera (lice), Heteroptera (bugs), Siphonaptera (fleas) and Diptera (flies) can be parasitized on birds (Kehlmaier and Quassier, 2013; Ombugadu et al., 2019).

Lice species seen on birds are included in the suborders Ischnocera and Amblycera of the Phthiraptera order and have chewing type of mouth structure, so they fed on skin debris and feathers. Because lices are obligate-permanent ectoparasites, they can not survive without a host for so long, therefore, the entire life cycle must be completed on the host (Ombugadu et al., 2019). Following lice, mites (Acari) considered the second richest ectoparasitic group parasitized on birds (Negm et al., 2018). Ectoparasitic mites of birds can be categorized mainly under two groups; those living in/around the nest and permanently living on the host (Proctor and Owens, 2000). Ixodida (ticks) and Mesostigmata suborders of mites include most of the temporary and permanent species (Proctor and Owens, 2000). Ticks fed by blood sucking for a while and leaving hosts, spend most of their time in hidden areas like nests, burrows, crevices and cracks. Several soft (Argasidae) and hard (Ixodidae) tick species parasitized on birds can lead to anemia and paralysis (Gothe and Neitz, 1991) and also transmit some pathogens such as bacteria, virus and protozoa (Shah et al., 2004). Another blood-sucking and temporary ectoparasitic mite group belongs to *Dermanyssus* and *Ornithonyssus* genera. These are generally known, as 'fowl mites' or 'red poultry mite', but actually their natural hosts are small passerine birds (Proctor and Owens, 2000). *Dermanyssus gallinae* fed by sucking blood, especially at night, from a very wide range of hosts such as chicken, pigeon, house sparrow, starling, pet canaries, parakeets, rarely cat, dog, rodent, horse and even humans (Mullen and Oconnor, 2002; Marchiondo and Endris, 2019).

According to literature review; there are several studies on ectoparasites of ornamental or cage birds in the world (Heylen and Mattyhssen, 2008; Kounek et al., 2011; Boseret et al., 2013; Kehlmaier and Quaisser, 2013; Moodi et al., 2013; Liv-



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inius et al., 2018; Saranya et al., 2018; Fard et al., 2020). However, there are limited studies on this subject in Turkey (Dik et al., 2011; 2013).

The aim of the present study was to investigate the ectoparasites of the ornamental birds (budgerigars, canaries) in Burdur city of Turkey.

## MATERIAL and METHODS

*Study area, animals and sampling*

The study was conducted from September to December 2020 on randomly selected 555 budgies in 192 cages and 121 canaries in 49 cages belonging to 12 different breeders in the center district of Burdur city, Turkey. The feathers of the head, neck, abdomen, legs, tail, beak, under the wings, around the cloaca and feet of all birds also cage equipments were examined in terms of ectoparasites. Detected samples were collected into eppendorf tubes containing 70% ethanol and transferred to the laboratory.

*Processing and identification of ectoparasites*

The collected samples were cleared in 10% KOH about 3 to 5 days, washed in distilled water for 24 hours and dehydrated in 70%, 80%, 90% and 99% series of ethanol (one day for each), respectively, then the fixed slides were mounted with Canada balsam (Dik et al., 2013; Fard et al., 2020). Measurement of the body dimensions of collected arthropods performed using Olympus BX51 microscope and cellSense Standard 1.18 software program. The identification was carried out with the help of diagnostic key literature (Moss, 1968).

*Statistical analysis*

Statistical analysis of the data obtained in this study was performed with the help of MiniTab16 statistical software with the Pearson chi-square test. The chi-square test was used to compare the infestation rates between budgerigars and canaries, and the observed differences were considered statistically significant if the P value found was less than 0.05.

## RESULTS

Depending on detailed examinations, no ectoparasite species were found on/between feathers and other body parts of overall 676 cage birds (555 budgeries, 121 canaries). However, a large number of *D. gallinae* was detected in cages and cage equipments. All developmental stages; 700 females, 247 males, 1142 proto and deutonymphs, 172 larvae and 1296 eggs of *D. gallinae* were identified as seen in Figure 1 and Figure 2.

Infestation rates with *D. gallinae* of budgerigar and canary cages presented in Table 1. Overall *D. gallinae* infestation rates

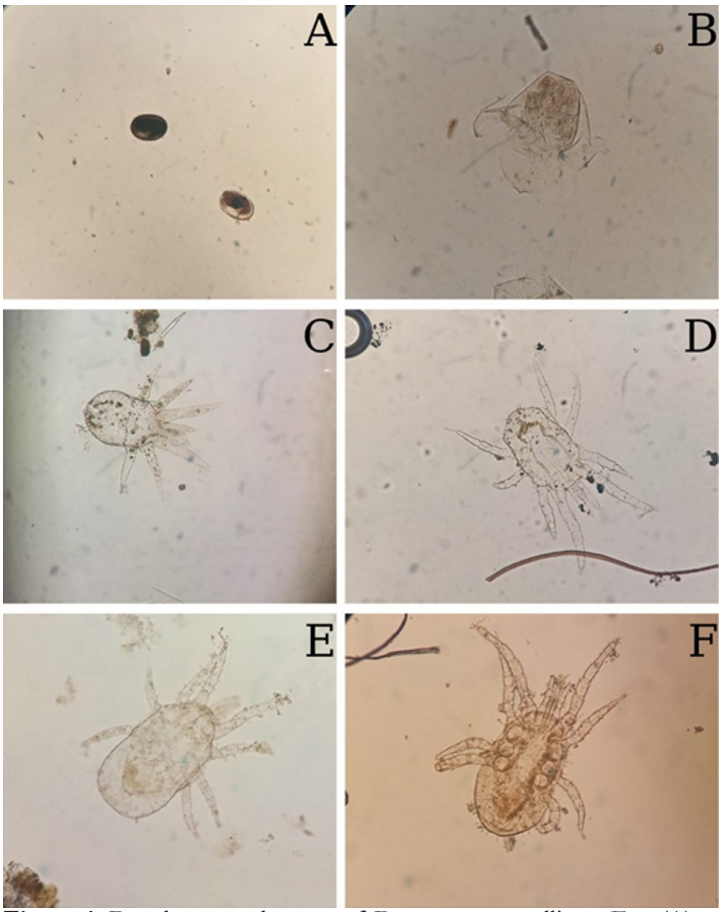


**Figure 1.** Developmental stages of Dermanyssus gallinae; Egg (A), hatching larva (B), larva (C), protonymf (D), deutonymf (E), male (F) (4x objective)

**Figure 2.** Female *Dermanyssus gallinae* with egg (4x objective)

**Table 1.** Number of non-infested and infested budgerigar and canary cages with *D. gallinae*

| Breeder No | Number of budgie cage | Number of budgies | Number of infested budgie cage | Number of canary cage | Number of canaries | Number of infested canary cage |
|---|---|---|---|---|---|---|
| **1** | 41 | 160 | 4 | 21 | 57 | - |
| **2** | 78 | 202 | 39 | 7 | 12 | 6 |
| **3** | 20 | 54 | - | - | - | - |
| **4** | - | - | - | 5 | 12 | 5 |
| **5** | - | - | - | 4 | 6 | - |
| **6** | - | - | - | 5 | 16 | - |
| **7** | 9 | 15 | 8 | 3 | 3 | 3 |
| **8** | - | - | - | 3 | 13 | - |
| **9** | 20 | 66 | - | - | - | - |
| **10** | 20 | 49 | - | - | - | - |
| **11** | 4 | 9 | 4 | - | - | - |
| **12** | - | - | - | 1 | 2 | - |
| **Total** | **192** | **555** | **55** | **49** | **121** | **14** |

were 41.67% (5/12) and 28.63% (69/241) for breeders and cages, respectively. For budgerigars; *D. gallinae* was detected in 4 of 7 breeders (57.14%), 55 of 192 cages (28.65%) and for canaries in 3 of 8 breeders (35.5%) and 14 of 49 cages (28.57%).

According to the data; no statistical significance was found for *D. gallinae* infestation rates between budgerigar and canary cages and equipments ($\chi 2 = 0.000$; DF = 1; P-Value = 0.992).

## DISCUSSION

Ectoparasitic infestations should not be ignored, especially because of causing harmful effects on the survival, development and reproductive success of birds (Hamstra and Badyaev, 2009). In addition, the fact that ectoparasites are vectors for various viral, bacterial and parasitic pathogens increases their importance even more (Moller et al., 1990; Kehlmaier and Quassier, 2013; Fard et al., 2020).

In some studies in Turkey (Dik et al., 2011; 2013) wild birds were caught for a short time with various traps, the ectoparasites on them were collected, and then birds were released to natural habitats. There are case reports about ectoparasites of cage birds from Turkey (Dik, 2010; Koc et al., 2017) and some other countries (Sychra et al., 2007; Alarcon Elbal et al., 2014). In addition, there are some studies on ectoparasites detected on birds in zoos (Sychra, 2005; Prathipa et al., 2013; Tags et

al., 2020).

In a study conducted in the Czech Republic; three species of Ornithomya (louse-flies), two species of fleas (*Ceratophyllus* and *Dasypsyllus*), 15 species of chewing lice (Myrsidea, Menacanthus, Brueelia, Penenirmus, Philopterus) were reported on 82 birds of 23 wild passerine bird (Passeriformes) species (Sychra et al., 2008). In a study performed in Bangladesh (Musa et al, 2012); *Menopone gallinae* (16.66%), *Menacanthus starmineus* (33.33%), *Colpocephalum turbinatum* (33.33%), *Columbicola columbae* (50%) and *Lipeurus caponis* (25%) lice species were reported from 24 pigeons as given incidences. In a study from India (Prathipa et al, 2015); *Syringophilus* sp. (14.51%) and *Dermoglyphus* sp. (17.74%) infestations were reported on psittacine birds (budgerigars, African love birds and cockatiels). Cristofani et al. (2017) reported *Ornithonyssus sylviarum* and *Menacanthus eurysternus* infestations for the first time from Italy in 78 captive canaries from an aviary. In another similar study; Saranya et al., (2018) reported *Columbicola* sp., *Menocanthus* sp., *Pseudolynchia* sp. and *Anaticola* sp. infestations on captive wild birds from India. In a study conducted in Iran (Fard et al., 2020); *M. gallinae*, *M. stramineus*, *C. columbae*, *Goniodes pavonis*, *Myrsidea fasciata*, an unknown species from *Philopetrus* genus, *Argas reflexus*, Pseudolinchya, and Culicoides infestations were reported in 318 birds belonging to four orders of Psittacines, Columbiformes, Passeriformes, and poultry were examined for ectoparasites. However, no ectoparasite infestation was observed on examined canary and budgerigars in the same study (Fard et al., 2020). From Ankara, the capital city of Turkey, *D.* gallinae infestations were reported on two species of parrots in a case report study (Koç et al, 2017).

Best of our knowledge; the present study is the first investigation study of ectoparasite of budgerigar and canaries in Turkey and one of the few studies in the world. In addition, within this study, *D. gallinae* infestation is reported for the first time from budgerigar and canaries from Turkey. The fact that only *D. gallinae* was detected in this study does not mean that only this species is parasitizing as ectoparasite in cage birds in the Burdur region and Turkey. It is necessary to conduct detailed studies in different regions using various methods to widen our knowledge about the prevalence of ectoparasites and the epidemiology of the diseases they cause. Additionally, no statistical significance was found on the budgerigar and canary cages and equipments' infestation rates with *D. gallinae*. Based on these findings, it can be concluded that *D. gallinae* does not prefer one of these two bird species in terms of feeding and it has a similar tendency for both bird species.

As an obligate hematophagous ectoparasite, red mite *D. gallinae*, suck blood from mainly poultry, less common pet birds, and even humans. In addition to its direct parasitic effects such as anemia, weight loss, dermatitis and decrease in egg production (Arends, 2008), it also has importance as a carrier of several vectorborne pathogens (De luna et al., 2008; Sparagano et al., 2014; Sommer et al., 2016). Transmission of bacteria and viruses such as *Salmonella enteritidis*, *Pasteurella multocida*, *Coxiella burnetti*, Spirochetes, Fowl poxvirus, Eastern, Western and Venezuelan equine encephalitis viruses via *D. gallinae* to another host have been demonstrated. While some others (*S. gallinarum*, *Chlamydia* spp., *Escherichia coli*, *Staphylococcus* spp., *Streptomyces* spp., Newcastle disease virus, *Plasmodium* spp.) were just isolated from red mite and transmission not proven yet (Valiente Moro et al., 2009; Ciloglu et al., 2020). Due to its ability to suck blood from humans and its potential vector role to various pathogen agents for both humans and animals, it seems necessary to take preventive measures and carry out more studies about *D. gallinae* and other arthropod parasites of ornamental or cage birds.

## CONCLUSION

In conclusion; this is the first investigation study of ectoparasites of budgerigar and canaries in Turkey. *D. gallinae* infestation is also reported for the first time from budgerigar and canaries from Turkey within this study. Further studies need to be performed to widen our knowledge about ectoparasite infestations of ornamental birds and vectorial potential of arthropods.

## DECLARATIONS

### Ethics Approval

The study was approved by the Animal Experiments Local Ethics Committee of Burdur Mehmet Akif Ersoy University (2020/694).

### Conflict of Interest

The authors declare that they have no competing interests.

### Consent for Publication

During the sample collection, informed consents had been obtained from all animal owners/breeders.

### Author contribution

Idea, concept and design: ÖY, OK

Data collection and analysis: ÖY, OK

Drafting of the manuscript: ÖY, OK

Critical review: ÖY, OK

### Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding authors on reasonable request.

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