

PREVALENCE AND CLINICO-PATHOLOGICAL EFFECTS OF ECTOPARASITES IN BACKYARD POULTRY

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ABSTRACT

To study the prevalence of ectoparasites and their clinicopathological effects on backyard poultry, 300 poultry of both sexes and different ages were examined in different areas of Patuakhali district from July 2005 to May 2006. Of them 86.67% were infested with one or more species of ectoparasites. Six species of lice such as *Menacanthus stramineus* (74%), *Menopon gallinae* (63%), *Lipeurus caponis* (48%), *Cuclotogaster heterographus* (25%), *Goniodes gigas* (18%), and *Gonicotes gallinae* (14%), two species of mites namely *Dermanyssus gallinae* (57%), *Knemidocoptes mutans*, (43%) and one species of fly, *Simulium* sp. (3.7%) were identified. Among these, *M. stramineus* was the most common. Aged above 5 months, 100% poultry were infested with ectoparasites but cocks and broody hens were severely infested. In broody hens, prevalence of *D. gallinae* was the highest (97.3%). *K. mutans* (43%) was mostly found in adult poultry aged above two years. The affected birds were emaciated with rough plumage, dandruff, and petechial haemorrhages on the highly infested skin. Small ulcerative lesions were common in *Dermanyssus gallinae* infestation in which the engorged, red parasites stacked tightly. In *K. mutans* infestation, legs were rough, swollen with scaly appearance, which was from tibiotarsal joint downwards to the joint of the toes. Some of the severely affected birds showed lameness but no malformation was observed. Histopathologically, scaly leg was characterized by hyperkeratosis and acanthosis. In tissue sections, the mites were observed as transverse or cross section in the deeper parts of the stratum corneum or the superficial layers of the stratum malpighii of the skin and rarely go deeper. In some area of skin, there were losses of epithelium. In advanced cases, there was secondary pyogenic infection; characterized by severe pus cell infiltration in the dermis. The present study suggests that ectoparasitic infestation is very common in the backyard poultry of Bangladesh and they are associated with the production of some clinicopathological effects variable degree.

Key words: Prevalence, clinico-pathological effects, ectoparasites, backyard poultry

INTRODUCTION

Poultry industry development in Bangladesh has taken a quantum leap in the last three decades; however the growth has been mainly restricted to commercial poultry. Rural backyard poultry, though still contributing to the national egg production, are still the most neglected one. Like all other animals, backyard poultry too suffer from a wide range of maladies. In semi-scavenging system, poultry is found to be infested with various types of ectoparasites including different species of lice, mites etc. (Abedin and Huq, 1977; Rahman *et al.*, 1989). The ectoparasites do lower the reproductive success of the birds, and during periods of heavy infestation, may weaken them, lower their resistance. They suck blood, interfere with the feed consumption by giving continuous irritation and thus they are associated with emaciation, anaemia and eventually loss of production. In some cases, severely affected birds may die (Soulsby, 1982).

In our country, only the prevalence of ectoparasites in backyard poultry has been studied. But unfortunately the deleterious effects of ectoparasites on health of backyard poultry have not yet been studied. By considering these points, the present research work was taken to study the over all prevalence of ectoparasites and to study the clinicopathological effect of ectoparasites in backyard poultry.

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MATERIALS AND METHODS

Collection of poultry

Prevalence of ectoparasites in backyard poultry and their clinico-pathological effects were studied from July 2005 to May 2006 in different areas of Patuakhali. Identification of the parasites and other relevant work were done in the Department of Parasitology, Faculty of Veterinary Science (FVS), Bangladesh Agricultural University (BAU), Mymensingh. The histopathological studies were performed in the Department of Pathology, FVS, BAU, Mymensingh. A total of 300 chickens were purchased from the local markets and farmers' household of the study area.

Collection and identification of ectoparasites

To study the prevalence of ectoparasites the birds were subjected to antemortem examination. The birds were examined using magnifying glass, for the presence of ectoparasites and any detectable lesions by parting of feathers, by digital palpation and close inspection. Ectoparasites were collected by hand picking and preserved in glycerin alcohol (95 parts of alcohol and 5 parts glycerin) in separate vials for each host. Parasites were identified by preparing permanent slides according to the procedures described by Cable (1957), by using keys and description given by Soulsby (1982) and Wall and Shearer (1997).

Pathological observation

To study the pathological lesions, seriously affected birds were subjected to postmortem examination. Tissues with severe lesions were collected, preserved in 10% buffer neutral formalin and processed for histopathology. Histopathological changes were studied by preparing permanent slide according to the description given by Luna (1968).

Statistical analysis

The prevalence of an ectoparasite in the specific body location(s) was calculated according to the definition of point prevalence (Thrusfield, 1995).

RESULTS AND DISCUSSION

Prevalence of ectoparasites in backyard poultry

During the present study, 300 poultry belonging to different age groups were examined, of which 260 (86.67%) poultry were infested with one or more species of ectoparasites (Fig. 1).

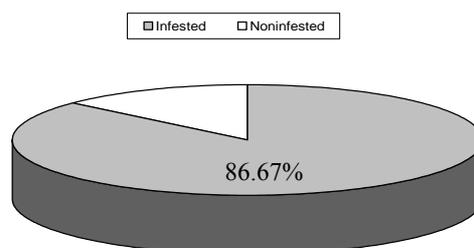


Fig. 1 Prevalence of ectoparasitic infestations in backyard poultry in Bangladesh

High (86.67%) prevalence of ectoparasites belonging to nine different species as recorded in this study is more or less similar to the previous studies at home (Abedin and Huq, 1970) or elsewhere in the world (Soulsby, 1982, Abebe *et al.*, 1997, Permin *et al.*, 2002; Saxena *et al.*, 2004), which recorded anything from lowest 56.5% (Koroglu *et al.*, 1999) to a highest 100% (Permin *et al.*, 2002) from different parts of the world. Saxena *et al.* (2004) reported 60.9% lice infestation in fowls in neighbouring India. There had been a difference in the percentage of infestation with lice in male and female chickens as reported by Okursoy and Yilmaz (2002) who recorded 80.6% and 59.4% infestation in cocks and hens respectively. Koroglu *et al.* (1999) examined 600 chickens and found that 56.5% birds were infested with one or more species of lice in Turkey. Martinez *et al.* (2001) observed that 91% poultry were affected with ectoparasites in Venezuela. The apparent

differences in percentage of infestation justified by the fact that the studies had been undertaken in different parts of the world and the methods of husbandry were different. Nevertheless, the climatic condition, method of study, age and breed/species of poultry and sample size also may be likely contributory factors.

Besides, the village poultry are mostly neglected and reared only a little or no extra feed supplement, and improper housing that makes them malnourished. The keeping condition is also very unhygienic, often crowded in a small place with little or no ventilation. All these factors either alone or in combination might have important role in the high prevalence of ectoparasites in backyard poultry.

In the present study, recording of 100% infestation (260 out of 260), often severely, in birds over 5 months is not unexpected. Since birds of this age and above scavenge through a wider area of the farmers' house that makes them more exposed to the source of infestation. Although the root causes of high infestation rate with ectoparasites in adult poultry is a little mystery and little understood, there are hypothesis that in extensive management systems, where the chickens have access to outdoor areas and not confined, do have a greater diversity of parasites (Abebe *et al.*, 1997). Also some lice like shaft louse of poultry (*M. gallinae*) does not develop to appreciable population until the birds are well feathered (Urquhart *et al.*, 1996).

Nine species of ectoparasites were identified of which 6 species were lice such as *Menacanthus stramineus* (74%), *Menopon gallinae* (63%), *Lipeurus caponis* (48%), *Cuclotogaster heterographus* (25%), *Goniodes gigas* (18%) and *Goniocotes gallinae* (14%), one species was fly, namely *Simulium* sp. (3.7%), and two species were mites such as *Dermanyssus gallinae* (57%) and *Knemidocoptes mutans* (43%) (Table 1). The parasitic loads varied from 1 to 25 in sq inch in highly affected body area of each bird. Recording of *M. stramineus* was the most common (74%) ectoparasites in this study agreed with previous observation by Martinez *et al.* (2001) and Koroglu *et al.* (1999). *M. stramineus* is a very active and voracious feeder. Their fecundity is high and the lice lay relatively large number of eggs in clusters (Urquhart *et al.*, 1996). Besides, after introduction into a flock the lice can spread from bird to bird very rapidly by contact. Perhaps these factors contributed towards a higher prevalence of *M. stramineus* in backyard poultry.

Table 1. Ectoparasites of poultry with their location and prevalence

| Orders | Name of parasites | Locations | Prevalence* | |
|--------------|--|--|-------------|-----|
| | | | No. | % |
| Phthiraptera | <i>Menacanthus stramineus</i> Nitzsch, 1818, Fig. 2 | Breast, thigh | 222 | 74 |
| | <i>Menopon gallinae</i> Linne, 1758, Fig. 3 | Every part of the body | 189 | 63 |
| | <i>Lipeurus caponis</i> Linn, 1758, Fig. 4 | Large wing feathers, head, feathers of cock | 144 | 48 |
| | <i>Cuclotogaster heterographus</i> Nitzsch, 1866, Fig. 5 | Head, neck | 75 | 25 |
| | <i>Goniodes gigas</i> Taschenberg, 1879, Fig. 6 | Body and feather | 54 | 18 |
| | <i>Goniocotes gallinae</i> de Geer, 1778, Fig. 7 | Base of feathers | 42 | 14 |
| Arachnida | <i>Dermanyssus gallinae</i> Degeer, 1778, Fig. 8 | Rapidly moving through out the body some stacked in the skin ulcer | 171 | 57 |
| | <i>Knemidocoptes mutans</i> Robin, 1860, Fig. 9 | Legs | 129 | 43 |
| Diptera | <i>Simulium</i> spp, Latreille, 1804, Fig. 10 | Breast and abdomen | 11 | 3.7 |

*Poultry population for study was 300.

Finding of fully engorged *Simulium* sp. on the body of the poultry was interesting. It was almost black in colour but the abdomen was red as the fly was fully engorged with blood. Thorax was humped over the head. Antennae were long with 11 segments but not plumose. The wings were broad and they had no scales and hairs except for bristles on the thick anterior veins. The body was covered with short golden or silvery hairs. These morphological characteristics conform to the morphology of *Simulium* sp given by Soulsby (1982), Lapage (1962) and Wall and Shearer (1997). The flies like *Simulium* usually visit the host for a blood meal, and



Fig. 2. *Menacanthus stramineus* Nitzsch, 1818

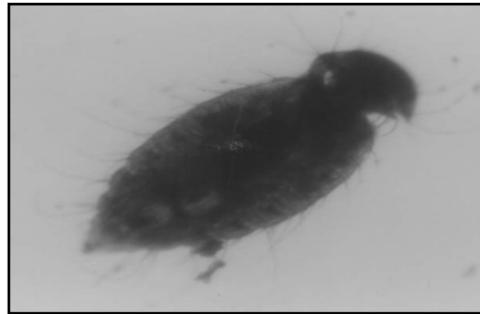


Fig. 3. *Menopon gallinae* Linne, 1758



Fig. 4. *Lipeurus caponis* Linne, 1758

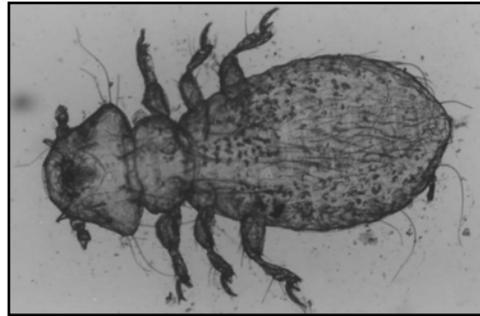


Fig. 5. *Cuclotogaster heterographus* Nitzsch, 1866



Fig. 6. *Goniodes gigas* Taschenberg, 1879



Fig. 7. *Goniocotes gallinae* de Geer, 1778



Fig. 8. *Dermanyssus gallinae* de Geer, 1778

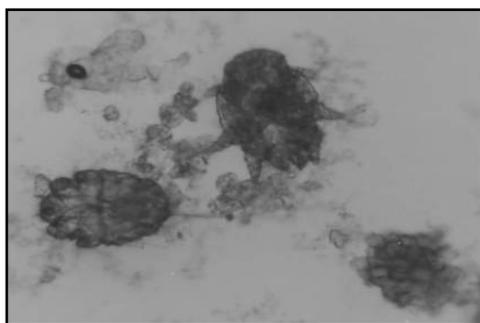
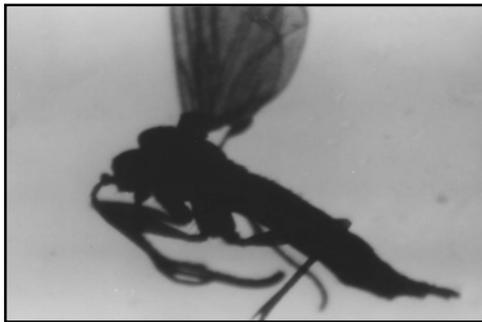
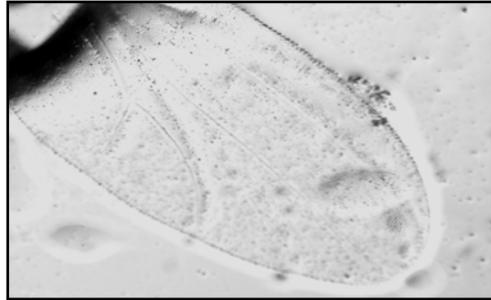


Fig. 9. *Knemidocoptes mutans* Robin, 1860

Prevalence of ectoparasites in poultry



Cross section of mite

Fig. 10. *Simulium* sp. with antenna and wing Latreille, 1804

Acanthosis

Hyperkeratosis



Fig. 11. Scaly appearance of legs affected with *K. mutans*



Fig. 12. Hyperkeratosis and acanthosis in the skin of affected legs showing cross section of mite, *K. mutans* (10x)

Pus cells infiltration

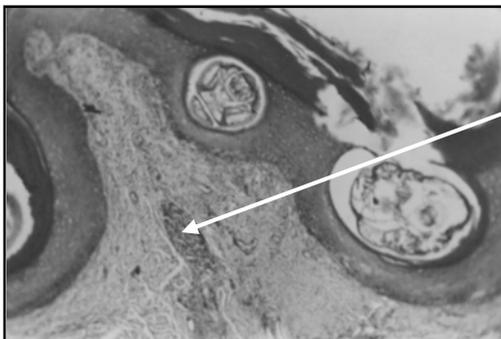


Fig. 13. Purulent dermatitis in the advanced stage of scaly leg mite infestation (10 x)

it is very likely that once disturbed they would fly away from the host. But the flies were so heavily engorged that they possibly lost their capability of flying, at least for the time being. This is well known for as a cause of great annoyance and irritation. Regular blood meal by few flies may lead to anaemia (Soulsby, 1982). The fly also bites human being, and injects anticoagulants into the feeding site that can lead from mild to severe allergic reactions in sensitive individuals. Moreover the fly can also be a vector of *Leucocytozoon caulleryi*, an avian malarial parasite. Therefore, recording of the fly bears special significance. It would be interesting to study further about the possible effect of these flies in human, especially bites related allergy.

Relatively more severe infection in broody hens and cocks as revealed in this study agrees with the previous observations by other workers. Okursoy and Yilmaz (2002) recorded severe infestation in cocks with lice. Although the cause of high infestation rate of ectoparasites in cocks and hens cannot be exactly explained but it is observed that male sex hormone make the individual more susceptible to the parasitic infection and mean parasitic burden is high in male (Ackert and Dewhirst, 1950; Todd and Hollingsworth, 1951). On the other hand, broody hens usually pass more time in incubation and less devoted in grooming, preening, parching and rocking. They mostly remain in the nests. Besides, it is well known that increased level of prolactin and progesterone (P_4) depress the immune system of the individual (Lloyd, 1983). In broody hen prolactin level is usually high (Jiang *et al.* 2005). This probably explains why the broody hens were more severely infested. In broody hens, prevalence of *Dermanyssus gallinae* was the highest and it was 97.31% (34 out of 35).

Clinical and pathological effects of ectoparasites on backyard poultry

In this study, it was observed that ectoparasites had adverse effects on backyard poultry. The infested birds were emaciated, indicated by the prominence of keel bone, atrophy of thigh muscle. The affected birds had rough plumages and the skin palp had plenty of dandruffs. Petechial haemorrhages were found on the skin of birds those had severe infestation with lice. Small ulcerative lesions were common in *Dermanyssus gallinae* infestation in which the engorged, red parasites stacked tightly. *Simulium* sp. was observed on the body of the birds, which were fully engorged with blood. In adverse effect in terms of morbidity such as emaciation, atrophy of thigh muscle and breast muscles, roughness of the plumage, deformity of the legs, ulcerative lesions, petechial haemorrhages on the skin, etc as observed in the birds were very likely due to the results of the ectoparasites infestation. Other scientists in different countries also reported similar findings in poultry. Schihchiang *et al.* (2004) reported yellow coloured, volcano shaped papules on the skin under the wings and legs of poultry due to chigger's mites' infestation. Islam *et al.* (1999) recorded restlessness, feather and skin damages and decreased feed intake due to *Lipeurus caponis* infestation in layer in Bangladesh. Cosoroaba (2001) found significant decrease in egg production and increased mortality due to *Dermanyssus gallinae* infestation in layer. Bruneau *et al.* (2001) identified the red mite of poultry, *D. gallinae*, as one of the most economically important ectoparasites in layer hens in France. Although the exact mechanisms of the major pathological changes are not known but it is well known that poultry lice bites the birds, eat off host tissues, secretions of quill feathers, etc. Their biting is usually irritating and painful; poultry become restless resulting decrease in feed intake (Islam *et al.* 1999, Soulsby, 1982). So, eventually poultry become emaciated. Due to gradual wasting, atrophy of the breast muscle and thigh muscle occur and resulting prominence of keel bone. Probably continuous biting leads to petechial haemorrhages on the skin. *K. mutans*, infestation, lesions were observed in the epidermal scales from tibiotarsal joint downwards to the joint of the toes. *K. mutans* was mostly found in adult poultry aged above two years. Legs of the affected poultry were rough, and large and yellowish white crusty materials covered the whole limb up to the toes (Fig. 11). Removal of the crust exposed the inflamed, moist surface of the limbs with white glistening appearance. Some of the severely affected birds showed lameness but no malformation was observed. Same types of gross pathological changes were reported by Soulsby (1982), Lapage (1962) and Urquhart *et al.* (1996). *Knemidocoptes mutans* is a burrowing mite (Urquhart *et al.* 1996), which deeply burrows into the skin of the legs and thus sets up inflammatory reactions. Exudation occurs which in turn become crusty and replaces the normal smooth scales of the legs.

Histopathology

Histopathology was performed to study the lesions caused by *K. mutans*. Deep scrapings from the suspected legs showed huge number of turgid globular mites under the surface of the crust (Fig. 9). The parasites pierced the skin underneath the scale, causing an inflammation with exudates that harden the surface and displaced the

scales. In tissue sections, the mites were observed as transverse or cross section (Fig. 12) in the deeper parts of the stratum corneum or the superficial layers of the stratum malpighii of the skin and rarely go deeper. The characteristic lesions were observed as hyperkeratosis and acanthosis (Fig. 12). In some area of skin, there were losses of epithelium. In advanced cases, there were secondary pyogenic infection; characterized by severe pus cell infiltration in the dermis (Fig. 13). This finding agrees with the findings of Lapage (1962). As *K. mutans* is a burrowing mite, they set up inflammatory reactions during burrowing. Characterization of scaly leg lesions by hyperkeratosis, parakeratosis and acanthosis, as seen in histopathology explains this process of inflammatory changes following the infestation. Presence of the mites in the deeper layer of the epidermis also justifies the relationship of the mite infestation with the pathological changes. This also demonstrates the relationship of this mite with *Sarcoptes* spp. The lesions described in this study were also described earlier by other workers (Lapage, 1962; Permin and Hansen, 1998).

In this study, prevalence of ectoparasites and their clinicopathological effects on backyard poultry had been studied. But the effects of ectoparasites on the production performance of backyard poultry had not been evaluated which would provide a clear justification of the control program suggested. So this area needs special attention in any future study.

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