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Preliminary Survey of Ectoparasites Infesting Chickens (*Gallus domesticus*) in Four Areas of Sokoto Metropolis

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ABSTRACT: A faunistical study was undertaken to determine the prevalence of ectoparasites of chickens in four areas of Sokoto metropolis, Nigeria, on 160 chickens raised under free-range system. Both the skin and plucked feathers were thoroughly searched for the presence of ectoparasites between July and December 2009. The results indicate that all the chickens (100%) harboured ectoparasites. Five lice, two mites, two tick and one flea species were identified with the following prevalences: the shaft louse, *Menopon gallinae* (8.1%), the chicken body louse, *Menacanthus stramineus* (6.9%), then the wing louse, *Lipeurus caponis* (5.0%), the body and feather louse, *Gonoides gigas* (4.4%) and finally the fluff louse *Gonoicotes gallinae* (3.1%). The two tick species were *Argas persicus* (8.8%) and *Ixodid* larvae (5.6%). The two mite species were *Cnemidocoptes mutans* (9.4%) and *Cnemidocoptes gallinae* (8.1%). The sticktight flea *Echidnophaga gallinacea* was the only flea species found (10.6%). No association was found between ectoparasitism and sex, breed and fur colour ($P > 0.05$), however a strong positive association was observed with fur texture ($P < 0.05$). This study has shown that ectoparasites are highly prevalent on traditionally managed chickens in the study areas. Further detailed study with particular reference to ectoparasitism and assessment of their impact is recommended.

Keywords: Ectoparasites, Free range, Chickens, Prevalence, Infestation, Sokoto

INTRODUCTION

Chicken population in Sokoto State is estimated at 2 million with free-range chickens forming the largest population and 21.1% of the people in the state rear chickens (Hassan *et al.,* 2006). Almost all the families in developing countries keep chickens under free ranging system (Kabatang *et al.*, 1990, Aini 1990, Pandey *et al*., 1992). Permin and Bisgaard (1999) also reported that 80% of poultry population in African and Asia are kept under free range system.

A number of authors (Pandey *et al*., 1992, Permin and Bisgaard, 1999) hence observed that, mismanagement, predation, thefts, lack of supplementary feeding and parasite infestations are factors that affect the free range system in Africa, as they cause 80-90% mortality of local free range chickens.

Arthropod ectoparasites have a major impact on husbandry, productivity and welfare of domestic animals (Colebrook and Wall, 2004). Ectoparasites, such as ticks and fleas, live on domestic chickens. They can cause severe dermatitis and may act as vectors for pathogenic agents, resulting in serious diseases not only in chickens, but also in humans. Hard ticks are the vectors of a wide range of important diseases worldwide, including viruses, bacteria, and protozoa. These include: Rocky Mountain Spotted Fever (spotted fever group, SFG), Boutonneus fever, African tick fever, Russian tick typhus, Q fever, Encephalitis, Tularemia, Relapsing fever and Lyme disease More recently, ticks have been implicated as vectors of additional diseases including anaplasmosis, babesiosis, and ehrlichiosis. Ticks are also involved in tick paralysis, the condition caused by a toxin or toxins found in the saliva of ticks (Service, 1996).

The presence of fleas is generally associated with skin disorders (dermatitis), pruritus, severe itching and allergic reactions in infested hosts. They may also cause pest problems in contaminated environments. They also act as vectors of pathogenic agents, such as Rickettsia disease (murine typhus), bacterial disease (plague) and viral disease (myxomatosis) (Koutinas *et al.*, 1995).

Feeding activity of the ectoparasites may result in significant blood loss, secondary infestations, pruritus, excoriation and in some cases premature death. Ectoparasites may also cause indirect harm including behavioural disturbances, such as increased frequency of rubbing or scratching, leading to reduced time in feeding. For cattle, less grazing and general disturbed behaviour, decreases production of meat or milk. In some cases, infected animals may resort to self-wounding, particularly when ectoparasites are present in high densities (Berriatua *et al.*, 2001).

Several surveys have pointed out the importance of ectoparasites in small animals. However, there are differences in respect to their frequency and geographical locations (Nithikathkul *et al.*, 2002, 2005; Shimada *et al.*, 2003; Abdu *et al.*, 2005; Tolossa *et al*., 2009). In addition, ectoparasitic infestation as related to the fur conditions and the colour shades of the chickens are lacking. The purpose of this study was to identify ectoparasites found on domestic chickens in four areas of Sokoto Metropolis. As far as we are concerned this is the first report of ectoparasites on chickens in this area. It is hoped that the results could be used in making objective decisions in control strategies.

MATERIALS AND METHOD

Study Area

The study areas are Gidan Dare (Area 1), Gandu Area opposite Kofar Gawo (Area 2), Kwanni Area opposite Kofar Gabas (Area 3) and Runjin Sambo west of Gidan Ashana (Area 4). All the four areas are located in Sokoto metropolis. Sokoto State is located in the North Western part of Nigeria, covering between longitude 4^0-5^0 North and longitude 11^0-13^0East and latitude 4^0-6^0 North. Vegetation type is Sudan/Sahel Savanna in which rainfall starts late in May or June to September or early October.

Study Animals and Sample Collection

The study animals consisted mainly of free-ranging local and exotic chickens in the four study areas. Samples were collected from 160 chickens in the four (4) areas (40 chickens per area). Prior to sampling, a brief lecture was delivered to the chicken rearers on ectoparasites and their effects in view of encouraging active participation. The chickens were examined thoroughly for ectoparasites between July and December 2009. On each sampling day, the chicken rearers were visited very early in the morning, before they allow their chickens to free range. Ectoparasites were collected from the birds by displaying the feathers horizontally against their anatomical direction of alignment so as to expose them. Ticks were removed with the aid of a forceps. Lice and fleas were collected from hosts by parting the hairs or feathers, gently brushing the base of the feathers with a fine soft brush so as to prevent the chickens from injuries. Mites were collected by scraping the skin surface with the edge of a slide. All the parasites collected were counted and placed in sampling bottles containing 70% ethanol. Each chicken examined was assigned a serial number on the sampling bottle for easy identification. The biodata of each chicken was recorded. The biodata included sex, breed, shade and colour. Out of the 160 chickens examined 60 (37.5%) were males, 100 females (62.5%); 104 (65.0%) were Local and 56 (35.0%) Exotic; 54 (32.5%) had Bushy fur texture, 70 (43.75%) were Normal fur textured while 38 (23.75%) were Scanty haired; 38 (23.75%) had Black fur colour,

60 (37.5%) had White fur colour while 62 (38.75%) were Mixed coloured. The parasites were immediately transported to Zoology Laboratory of Usmanu Danfodiyo University Sokoto for processing and identification.

Identification of Ectoparasites

The ectoparasites were placed in 10% KOH (clearing agent) 2-3 days before identification. Species determination was based on microscopic examination using dissecting and binocular microscopes to study their morphological characteristics for identification. The identity of the ectoparasites was established using identification guides by Walker (1994), and the works of Harwood and James (1979) and Chandler and Read (1961)

STATISTICAL ANALYSIS

The data obtained were analyzed using tables. Infestation of ectoparasites in sex, breed, colour and shade with their relative prevalences were tabulated. Chi-square was used to test the significant difference between the parameters tested and correlation analysis was used to find association between ectoparasites and age sex, colour and fur texture. Values of $P < 0.05$ were considered as statistical significant.

RESULTS

All the 160 chickens examined in the four areas were infested with various ectoparasites. Ectoparasites were encountered in this order of magnitude; Lice 44 (27.5%), Mites 28 (17.5%), Ticks 23 (14.4%), Fleas 17 (10.6%) while mixed infestations accounted for 48 (30.0%) (Table 1). The sticktight flea *Echidnophaga gallinacea* was more frequent 17 (10.6%) is the only flea species encountered in the study. The two mite species encountered were *Cnemidocoptes mutans* on 15 (9.4%) chickens and *Cnemidocoptes gallinae* on 13 (8.1%). With respect to lice, the shaft louse, *Menopon gallinae* was more frequent 13 (8.1%), followed by the chicken body louse, *Menacanthus stramineus* 11 (6.9%), then the wing louse, *Lipeurus caponis* 8 (5.0%), body and feather louse, *Gonoides gigas* 7 (4.4%) and finally the fluff louse *Gonoicotes gallinae* occurring in 5 (3.1%) chickens. Two tick species *Argas persicus* and *Ixodid* larvae were observed on 14 (8.8%) and 9 (5.6%) chickens respectively (Table 1)

Table 1: Species of Ectoparasites Found in the Study Areas

Type of ectoparasite	Frequency	%
Lice		
Menopon gallinae	13	8.1
Menacanthus stramineus	11	6.9
Lipeurus caponis	8	5.0
Gonoides gigas	7	4.4
Gonoicotes gallinae	5	3.1
Tick		
Argas persicus	14	8.8
Ixodid larvae	9	5.6
Fleas		
Echidnophaga gallinacea	17	10.6
Mites		
Cnemidocoptes mutans	15	9.4
Cnemidocoptes gallinae	13	8.1
Mixed infestation	48	30.0
Total	160	100

All the 60 males and 100 female chickens examined were found to be infested with one ectoparasites or the other. Twenty eight (28) female chickens had lice as against 16 males, 17 females were infested with mites compared to 11 males. Fourteen (14) and nine (9) ticks occurred in female and male chickens respectively, while 10 female chickens had fleas compared to 7 males; mixed infestations were 17 and 31 on males and female chickens respectively. Although many of the ectoparasites were found on females, there was no significant different between the two sexes ($P>0.05$) (Figure 1).

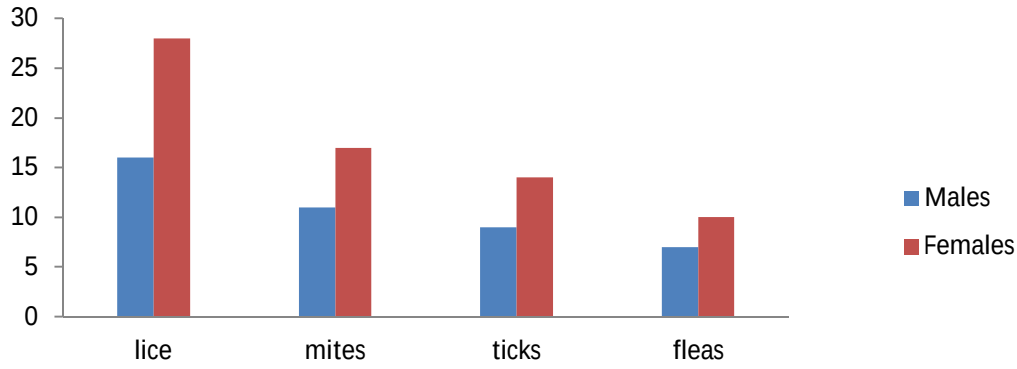

Figure 1: Distribution of Ectoparasites relative to gender

With respect to breed, all the local and exotic chickens examined were infested with ectoparasites. Thirty (30) local chickens had lice (28.8%) as against 14 exotic (25.0%), 17 local chickens were infested with mites (16.3%) when compared with 11 exotic (19.6%), 15 local chickens had ticks (14.4%) as against 8 exotic (14.2%), and lastly, 12 local chickens were infested with fleas (11.5%) when compared to 5 exotic chickens (8.9%) . mixed infestations accounted for 30 (28.8%) and 18 (32.1%) on local and exotic chickens respectively. There was no statistical difference in the distribution of the parasites between the breeds ($p>0.05$) (Figure 2).

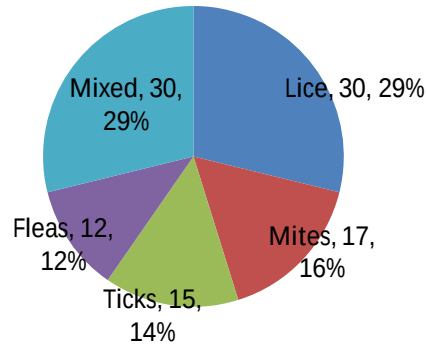

Figure 2: Distribution of ectoparasites relative to host breed

The prevalence of ectoparasitic infestations based on fur condition show that, normal haired chickens had the highest occurrence of Lice 22 compared to bushy 13 and scanty haired chickens 9. Fifteen (15) normal haired chickens had mites followed by bushy 9 and 4 scanty haired chickens. Eleven (11) normal haired chickens had ticks followed by 7 bushy and 5 scanty haired chickens. Similarly 10 normal haired chickens had fleas followed by 4 bushy and lastly 3 scanty haired chickens (Table 4). The results showed normal haired chickens to have the highest occurrence of ectoparasites and statistical analysis showed significant association between the fur condition of the chickens and presence of ectoparasites ($P < 0.05$) (Figure 3).

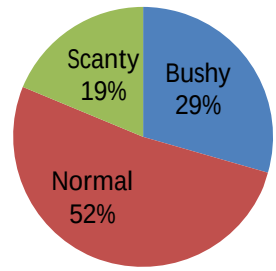

Figure 3: Infestation rates of ectoparasites on chickens with different texture

In this study, mixed coloured chickens were more infested with lice 23 as against 12 black and 9 white coloured. In a similar manner, mixed coloured chickens were more infested with mites 13, then black and white coloured with 8 and 7 respectively. In relation to tick infestation, mixed coloured were more infested 11 followed by black coloured 7 and then white coloured 5.

Mixed coloured were found to be more infested with fleas 9 as against 5 black coloured and 3 white coloured (Figure 4). Although mixed coloured chickens were more infested, statistical analysis showed no association between ectoparasites and the different fur colours of the hosts ($P > 0.05$).

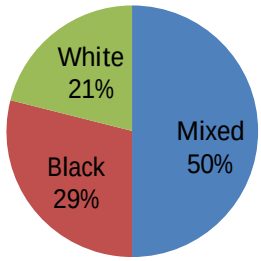

Figure 4: Infestation rates of ectoparasites on chickens with different colour

DISCUSSION

In the present study, 100% of the chickens, comprising both local and exotic breeds, from free-range production system harboured ectoparasites. This is comparable to studies in Bangladesh (Shanta *et al*., 2006), Ethiopia (Tolossa *et al*., 2009), Zimbabwe (Permin *et al*., 2002) and northern Nigeria (Abdu *et al*., 2005), which also reported high prevalences of ectoparasites in local free-range chickens and included all the species found in this study. The high percentage prevalence observed in this study, may be a result of poor management system where the chickens are being jam-packed in the same cage which may enable one ectoparasite to move freely from one chicken to the other with ease. The high prevalence observed in this study, may also be attributed to free-ranging system which exposed the chickens to various ectoparasites.

It is of note however, that the exotic chickens in the study areas were also highly parasitized, just like their local counter parts. The reason for this might be because they are also allowed to free-range and mixed with the local chickens, thus becoming vulnerable to ectoparasitism. Unlike exotic chickens that are managed under the extensive management system which cover the range of measures and practices relating to good housing, feeding and husbandry standards, including all-in-all-out systems to protect stock from disease predisposing factors. Thus as Pandey *et al*. (1992) reports that in extensive management systems, where the chickens have access to outdoor areas and not confined, the chickens do have a greater diversity of parasites.

The most prevalent parasite in this study was the sticktight flea, *Echidnophaga gallinacea* which occurs in 10.6% of the chickens. This parallels reports from south-eastern Nigeria (Ifeoma *et al*., 2008) where same species was found to be more prevalent in domestic chickens. Among the lice species, the shaft louse, *M. gallinae* showed the highest prevalence. Many other investigations have found *M. gallinae* to occur with high prevalence (Orkursoy and Yilmaz, 2002; SangvarAnond, 1993; Ifeoma *et al*., 2008 and Tanasak *et al*., 2009). This could probably be attributed to the fact that the species is highly adapted and prevalent in hot and humid areas of Nigeria (Fabiyi, 1980; Fabiyi, 1988).

The significantly high prevalence of ectoparasites in normal haired chickens, agrees with Jordan and Pattison, (1996) who worked on ectoparasites of poultry in London. According to the authors, normal haired chickens are easily more infested with ectoparasites due to the ability of the parasites to seek refuge, easily hide and absorb meal. This is all lacking in both scanty hair condition, where there is little or no hairs for the ectoparasites to hide, and bushy where the hairs texture is too thick for the ectoparasites to hide, burrow and or move around.

The non significantly high infestation of ectoparasites in mixed coloured chickens

may be due to the ability of the parasites to burrow and camouflage more in mixed colour than black and white colours respectively. This camouflage may have enabled the parasites to live and multiply in mix coloured chickens more than other fur colours.

Statistical analysis indicated that both sexes were equally infested with ectoparasites, although females harbored more of the ectoparasites. This non significant variation between the sexes could easily result during courtship. The male chicken may introduce more parasites on to the female during mating, since the male is forced upon the female for every mating. However, it is of the opinion of the chicken rearers (P. C., 2010) that the high prevalence of ectoparasites in the female chickens may be a result of the stationary state of the females during incubation which allows the female chickens to be more susceptible to ectoparasitic infestations. In addition the female chickens may emit some smell which may attract the parasites during incubation period (P. C., 2010).

Conclusively, it is evident from this study that all the chickens examined in the study areas were 100% infested with ectoparasites, sexes, breeds and colours were equally infested. The results also showed ectoparasitism rely on the fur texture of the chickens with normal haired chickens harbouring more ectoparasites. Therefore, there is need for enlightenment campaign to the chicken rearers on the dangers resulting from ectoparasitic infestation on chickens. It is also concluded that, proper sanitation, good hygiene, use of specific chemicals in the approved manner may also help the poultry farmers in the control of ectoparasites. Also there is need for the state and local government to extend their veterinary assistance to the poultry farmers. Further research to access the impact of these parasites on health and production performance of the scavenging chickens including cost effectiveness of control strategies is suggested.

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