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RESEARCH PAPER

ASSESSMENT OF ECTOPARASITIC INFESTATION IN CHICKENS (*GALLUS GALLUS DOMESTICUS*) IN THE SUNYANI WEST DISTRICT, GHANA

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ABSTRACT

Assessment of ectoparasitic infestation in chickens raised under intensive care system was undertaken to determine their prevalence in three poultry farms in the Sunyani West District of Ghana from December, 2011 to April, 2012. With the aid of a magnifying glass, various body areas of chickens were examined for the presence of ectoparasites. All matured chickens aged 72 to 82 weeks harboured lice species identified to be Menacanthus stramineus and Menopon gallinae. Co-infestations with chicken mite, Dermanyssusgallinae, in 43.8% and 36.5% of matured chickens from Farms 2 and 3 respectively were observed. However, lower lice infestation in growers aged 24 to 40 weeks from Farms 1 (72%), 2 (62.7%) and 3 (73.3%), and no mite infestation were observed. All growers from the three farms had significantly higher prevalence in the ventral, wing, cloacal and tail areas compared with femoral, head and neck areas of their bodies. In Farm 1, the cloacal and tail areas of chickens had significantly higher prevalence than the head and neck areas (χ^2 (1) = 176.74, p< 0.001). The study revealed high prevalence of ectoparasitic infestation in chickens of all age groups in all the poultry farms. This threatens their health and productive potential as well as the viability of the poultry industry. Regular examination of the highly infested body areas may help poultry farmers detect and control ectoparasitic infestation or re-infestation early to maintain good health and increase the productive potential of chickens in the Sunyani West District.

Keywords: *Ectoparasite, infestation, Gallus domesticus, prevalence*

INTRODUCTION

The Poultry industry provides enormous opportunities for the provision of animal protein (Scanes, 2007), nutritional security and the creation of employment (FAO, 2006) and income generation (MOFA/DFID, 2002). In Ghana, the rapid growth of the poultry sector during the 1980 to 1990's supplied about 80% of the chicken meat and eggs requirement in the country (Rondon and Ashitey, 2011).

A major threat to the viability of the poultry

industry is ectoparasitic infestations, which have a major impact on husbandry, productivity and welfare of domestic chickens (Colebrook and Wall, 2004). Ectoparasites are reported to transmit a number of infectious diseases to chickens (Pattison *et al*., 2008), serve as intermediate host for a range of helminthes parasites (Arends, 2003; Permin and Hansen, 1998; Shah *et al.*, 2004) and may have adverse implications on the productive and economic potential of chickens (Sparagano *et al*., 2014). DeVaney (1976) reported that white Leghorn-hens infestation with chicken body louse, *Menacanthus stramineus*, resulted in decreased average hen weight and egg production compared with non-infested control hens of the same age. Ectoparasites reduce seminal fluid in infested chickens (DeVaney *et al*., 1977) and their feeding activity may result in significant blood loss, secondary infection, pruritus, excoriation and, in some cases, premature death of chickens (Bala *et al*., 2011).

In intensive chicken production, effort is made to control parasitic infections (Mekuria and Gezahegn, 2010) using veterinary medication and good sanitation (Grobbelaar and Fourie, 2006). However, this standard practice cannot be said to be the case in all chicken farms. In environments with high ectoparasitic infestation, chickens invest more in anti-parasite defense, which may limit their investment in other life history components such as survival (Moyer *et al.,* 2002) and production (DeVaney, 1976; Sabuni *et al*., 2010). The result is heavy economic losses to the poultry industry. This industry is very prominent in the Sunyani West District, providing large and reliable market for the large quantities of maize produced in the District (MOFA, 2015). This study assessed ectoparasitic infestation in chickens of poultry farms that use the intensive system of poultry management in the Sunyani West District of Ghana.

MATERIALS AND METHODS

Study design and data collection

Three poultry farms in the Sunyani West District (*7.367° N, 2.317° W*) of Ghana identified as Farms 1, 2 and 3 were selected for study between December, 2011 and April, 2012. A total of 250, 450 and 350 chickens ranging from 24 to 82 weeks old were sampled from Farms 1, 2 and 3 respectively and carefully examined for ectoparasites. At each farm, the number of chickens were taken from different pens in each poultry block and examined at various body sites, including ventral, cloacal and tail areas, for ectoparasites with the aid of a magnifying glass. For each chicken, the status of infestation and body site (s) involved were noted.

Ectoparasites examined in the laboratory were obtained from twenty chickens in the various pens for each farm. The selected body sites for each chicken were rubbed with cotton wool soaked in 70% alcohol to collect the parasites and placed in bottled container with 70% alcohol for preservation. Some feathers with ectoparasites attached were pulled from chickens, placed in the respective containers and transported to the laboratory of the Centre for African Regional Postgraduate Programme in Insect Science (ARPPIS), University of Ghana, for examination.

Examination of ectoparasites and data analysis

Ectoparasites were mounted under dissecting and compound microscopes at ten times magnification and identified based on morphological features: body shape and length of body parts such as head, thorax, antennae, legs and claws. Comparison of ectoparasitic infestation in different body sites of chickens examined for each poultry farm was carried out using chi-square test in Quantitative Parasitology 3.0 (Rozsa *et al*., 2000) to assess the significance of prevalences.

RESULTS

The comparative prevalences of ectoparasitic infestation in growers of the three farms are shown in Tables 1, 2 and 3.

Comparison of ectoparasitic infestation in different areas of chickens revealed significantly higher prevalence in the ventral, cloacal and tail, as well as wing areas compared with femoral and, head and neck regions in all three farms. In Farm 1 (Table 1), the cloacal and tail areas of chickens had significantly higher prevalence than the head and neck areas (χ^2 (1) = 176.74, $p < 0.001$). Farms 2 (Table 2) and 3 (Table 3) also had significant and comparable prevalences for the ventral, cloacal and tail, and wing areas when compared with other body areas of chickens.

Matured chickens aged 82 and 72 weeks in Farms 2 (n = 300) and 3 (n = 200) were observed to have 100% lice infestation with 43.8% (132) and 36.5% (73) co-infestations with mites respectively. However, lower lice infestation in growers aged 24, 33 and 40 weeks from Farms 1 (72%), 2 (62.7%) and 3 (73.3%) respectively, and no mite infestation

Table 1: Ectoparasitic infestation in 33-week old chickens from poultry farm 1

Area of chicken examined	Chickens infected (NPS)	Percentage prevalence (95%CI)	Chi-square (df); p-value (pairwise comparisons*)
Wing	113 (137)	45.2(39.0, 51.4)	32.54 (1); <0.001 (a,b)
Ventral	176 (74)	70.4(64.4, 75.8)	148.39(1);< 0.001 (b,c)
Femoral	41 (209)	16.4 (12.2, 21.6)	1.02(1); 0.314 (c,d)
Head & neck	33 (217)	13.2 (9.4, 18.0)	176.74(1); < 0.001 (d,e)
Cloacal & tail	180 (70)	72.0 (66.0, 77.2)	37.01 (1); < 0.001(e,a)

Annotations for pairwise comparisons of chicken body areas;* ***a, b**: Wing vs. ventral areas;*
b, c*: ventral vs. femoral areas;* ***c,d****: femoral vs. head & neck areas;* ***d, e****: head & neck vs. cloacal & tail areas;* ***e, a****: cloacal & tail vs. wing areas;* ***CI****, confidence interval; NPS, no parasite seen.*

Table 2: Ectoparasitic infestation in 24-week old chickens from poultry farm 2

Area of chicken examined	Chickens infected (NPS)	Percentage prevalence (95%CI)	Chi-square (df); p-value (pairwise comparisons*)
Wing	77 (73)	51.3 (43.3, 59.4)	0.48 (1); 0.487 (a,b)
Ventral	83 (67)	55.3 (47.3, 63.4)	85.85(1);< 0.001 (b,c)
Femoral	9 (141)	6.0 (3.0, 11.2)	1.20 (1); 0.274 (c,d)
Head & neck	5 (145)	3.3 (1.3, 7.6)	109.32 (1); < 0.001 (d,e)
Cloacal & tail	89 (61)	59.3 (51.3, 67.0)	1.94 (1); 0.163 (e,a)

Annotations for pairwise comparisons of chicken body areas;* ***a, b**: wing vs. ventral areas;*
b, c*: ventral vs. femoral areas;* ***c, d****: femoral vs. head & neck areas;* ***d, e****: head & neck vs. cloacal & tail areas;* ***e, a****: cloacal & tail vs. wing areas;* ***CI****, confidence interval; NPS, no parasite seen.*

Table 3: Ectoparasitic infestation in 40-week old chickens from poultry farm 3

Area of chicken examined	Chickens infected (NPS)	Percentage prevalence (95%CI)	Chi-square (df); p-value (pairwise comparisons*)
Wing	82 (68)	54.7 (46.7, 62.7)	4.03 (1); 0.045 (a,b)
Ventral	99 (51)	66.0 (58.0, 73.4)	114.14(1);< 0.001 (b,c)
Femoral	10 (140)	6.7 (3.6, 11.9)	1.09 (1); 0.296 (c,d)
Head & neck	15 (135)	10.0 (5.9, 15.9)	108.18 (1); < 0.001 (d,e)
Cloacal & tail	103 (47)	68.7 (60.7, 75.7)	6.23 (1); 0.013 (e,a)

Annotations for pairwise comparisons of chicken body areas;* ***a, b**: wing vs. ventral areas;*
b, c*: ventral vs. femoral areas;* ***c, d****: femoral vs. head & neck areas;* ***d, e****: head & neck vs. cloacal & tail areas;* ***e, a****: cloacal & tail vs. wing areas;* ***CI****, confidence interval; NPS, no parasite seen.*

were observed. The two species of lice and one species of mite recovered from the chickens were identified to be chicken body louse (*Menacanthus stramineus*), shaft louse (*Menopon gallinae*) and chicken mite (*Dermanyssus gallinae*).

DISCUSSION

A major threat to the viability of the poultry industry is heavy ectoparasitic infestation in chickens, which decrease average hen weight and egg production (DeVaney, 1976), and requires effective control to reduce economic losses to the industry. Accordingly, this study examined chickens for ectoparasites and observed 100% lice infestation, by *Menacanthus stramineus* and *Menopon gallinae*, in matured chickens, but lower lice infestation in growers. Additionally, 43.8% and 36.5% co-infestations with chicken mite, *Dermanyssus gallinae*, in two of the three farms (Farms 2 and 3) were observed in matured chickens unlike the growers that had no mite infestation.

M. stramineus and *M. gallinae* are noted lice species of poultry that feed on dry skin scales, scab tissue, feather parts (Mccrea *et al*., 2005) and host blood (Bala *et al*., 2011; Mccrea *et al*., 2005). *Menacanthus* lice feed on the blood of a wide variety of birds, including chickens, by piercing the quills of feathers and gnawing the epidermis. In doing so, they can spread disease and lower egg production (DeVaney, 1976; Agarwal *et al*., 1983). Lice in the family Menoponidae are not exclusive to poultry, but are also common parasites for migratory birds (Ash, 1960; Trivedi *et al*., 1991). These phthirapteran species affect chicken health directly by causing irritation, discomfort, tissue damage, blood loss, allergy, dermatitis, which in turn reduce the quantity and quality of meat and egg production (Arya *et al*., 2013; Ruff, 1999; Saxena *et al*., 1985).

The haematophagous poultry red mite, *Dermanyssus gallinae*, poses a significant threat to poultry production and hen health in many parts of the world (Sparagano *et al*., 2014). It is a potential vector of *Erysipelothrix rhusiopathiae*, a bacterium that causes erysipelas in domestic fowl (Chirico *et al*., 2003) and may infect swine (Wood, 1992) and a variety of other vertebrate species, including man (Brooke and Riley, 1999; Collgros *et al*., 2013) and birds. In poultry, erysipelas may cause sudden high mortality due to septicaemia and the zoonotic potentials of both *E. rhusiopathiae* and *D. gallinae* and this should be of concern

especially in farms where parasitic control is not effective. Acaricide-treated traps near mite aggregation sites, cracks and crevices in poultry house (Hearle, 1938), has been found to be essential for satisfactory control (Chirico and Tauson, 2002). Although its control is dominated by the use of synthetic acaricides (Sparagano *et al*., 2014), resistance (Beugnet *et al*., 1997; Nordenfors and Chirico, 2001) and treatment failure are widely reported.

Interestingly, significantly higher prevalence of ectoparasites in the ventral, wing, cloacal and tail areas of chickens compared with femoral, head and neck areas were observed. These body areas may serve as sites for regular examination for ectoparasitic infestation or re-infestation in chickens. Early identification of ectoparasites in chickens may not only enhance their effective control, but also ensure good health and increased productivity, enhancing economic returns of the farmer and improvement in their living conditions. As observed by Arya *et al*. (2013), higher parasitic infestations are noted in certain parameters such as poor chicken health, poor hygienic condition, poor feather condition and older birds. This observation is consistent with the significantly higher prevalence in the matured chickens compared with the growers. The results highlight the importance of regular examination of chickens for early detection and control of ectoparasites. It is imperative for poultry farmers to maintain hygienic conditions and embark on regular examination and control of ectoparasites to reduce the threat to health and productive potential of chickens.

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