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Prevalence of Ectoparasites in Haramaya University Intensive Poultry Farm

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Abstract: A cross sectional study was conducted from November 2010 to March 2011 to estimate prevalence of ectoparisites infestations in Haramaya University intensive poultry farm as well as to assess the effect of host related risk factors. Samples were randomly taken from 384 exotic chickens and were examined by close inspection with naked eyes and magnifying hand lens. Out of the total chickens examined, the following types and species of ectoparasites were identified: a species of flea, *Echidnophaga gallinacean*; a species of mite, *Dermanyssus gallinae* and four species of lice *Menopon gallinae*, *Menacanthus stramineus*, *Cuclotogaster heterographus* and *Lipeurus caponis*. The overall prevalence of lice infestations was 35.1%. Statistically significant difference ($P< 0.05$) was observed in the prevalence among the species of lice. Analysis of the effect of host related risk factors to the prevalence of lice infestation did not show statistically significant variation ($P>0.05$) between sexes, age groups as well as between breeds. The prevalence of flea infestations between the two breeds as well as the two age groups of chicken showed statistically significant difference ($P< 0.05$). All of the chickens examined (100%) were infested with red mite. Besides, 259 (67.4%) birds were suffering from mixed infestations. Finally, the observed results of our study suggest that appropriate ectoparasite control measures have to be practiced to mitigate the effect of infestation by poultry pests.

Key words: Ectoparasites · Haramaya · Intensive Farm · Poultry · Prevalence

INTRODUCTION

Poultry production is one of the economically important agricultural activities in Ethiopia. The total chicken population in the country is estimated to be 38.1 million [1]. The majority (99%) of these chickens are maintained under a traditional system with little or no inputs for housing, feeding or health care and are characterized by low output levels [2].

The low productivity of poultry can be partly attributed to a range of factors such as suboptimal management, lack of supplementary feed; low genetic potential, high morbidity and mortality rate due to various diseases. At night they are sheltered in small hen houses or in a room of the family house, to protect them from predators and bad weather. During the day, the chickens seek their food around the house [3].

Despite its drawbacks, the largest proportion of eggs and poultry meat consumed in the country comes from indigenous birds produced by rural growers. Since recent years, an emerging middle-class urban sector with higher income and more buying power has boosted the demand for poultry products. However, the traditional production system could not satisfy this demand; consequently, this condition has led directly to expansion of intensive and semi-intensive poultry production particularly within urban and peri-urban areas [4, 5].

On one hand, intensification of production system is imperative to meet the growing demand for poultry products. On the other hand, however, it is paramount importance to provide the required health care services against myriads of disease causing agents which affect the productivity of this sector. Where studies have been conducted, parasitic diseases and in particular ectoparasites has been identified as the major impediment to chicken health world wide owing to the direct and indirect losses they cause [6-8]. They can affect bird health directly by causing irritation, discomfort, tissue damage, blood loss, toxicosis, allergies and dermatitis which in turn alleviate quality and quantities of meat and egg production. Also they act as mechanical or biological vectors transmitting number of pathogens [9, 10].

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Despite their devastating effects, ectoparasites have received little attention in almost all the production systems. Hence, study with regard to determining the magnitudes of such parasites and identifying their types is fundamental to devise appropriate control methods. To this end, the objectives of this study were to determine the prevalence of ectoparasite infestation and to assess the effect of host related risk factors in intensive poultry farm at Haramaya University, eastern Ethiopia.

MATERIALS AND METHODS

Study Area Description: The study was conducted in Haramaya, eastern Hararghe zone of Oromia Regional State of Ethiopia. Haramaya is located approximately 527km east of Addis Ababa; 14km west of Harar town. The elevation of the area is about 2000m above sea level and geographically it located 041°59'58'' latitude and 09°24'10''longitudes. The district has about 63,723 cattle 13,612 sheep 20,350 goats 15,975 donkeys 530 camels and 42,035 chickens. The district receives an average annual rain fall approximately 900mm and climatically there are two ecological zones of which 66.5% is midland and 33.5% is lowland [11].

Study Population: The study was conducted on exotic chicken under intensive management system in the stated site. Poultry were selected according to their sexes, age groups and breeds as to be examined for the presence or absence of ectoparasites infestation. The age were conveniently subdivided in to young growers up to six months of age and adult chicken, where as the breeds were White leghorn and Bovan brown.

Study Design: A cross sectional study was conducted from November 2010 to March 2011 to estimate prevalence of ectoparisites infestations in Haramaya University intensive poultry farm. Hypothesized risk factors related to the infestation such as age, breed and sex were also taken in to account.

Sample Size Determination: The sample size was determined according to the formula given by Thrusfield [12] as follows:

$$n=\frac{1.96^2 * P_{exp} (1-P_{exp})}{d^2}$$

Where:

n = Required sample size
p_{exp} = Expected prevalence
d^2 = Desired absolute precision

For this study since the approximate previous prevalence value was unknown, an expected prevalence value (P_{exp}) of 50% with a desired absolute precision (d^2) of 5% and confidence interval of 95% was used to calculate the required sample size. Accordingly, 384 chickens were sampled for the study.

Sampling Procedure: Samples taken from chickens were examined by close inspection with naked eyes and magnifying hand lens. A representative of ectoparasites found in the body of the chicken was collected in the universal bottles containing 70% alcohol and the predilection sites of the body and hypothesized risk factors were noted in separate vial for each host. Collected samples were transported to the Parasitology laboratory; College of Veterinary Medicine, Haramaya University, Haramaya. The ectoparasites were then dehydrated first in 80%, then 90% and finally 100% alcohol before being cleared in xylene and mounted on a slide. Finally, the parasites were identified according to their morphological characteristics using entomological keys using light microscope as described by Soulsby [13].

Data analysis: Raw data and the results of parasitological examination were entered in to a Microsoft Excel spread sheets program and then were transferred to SPSS version 16 for analysis. The prevalence of ectoparasites was calculated as the number of positive samples divided by the total number of samples examined. Pearson's chi-square (χ^2) was used to evaluate the association of different variables with the prevalence of ectoparasites infestation. P-value less than 0.05 (at 5% level of significance) were considered significant in all analysis.

RESULTS

Out of the total 384 exotic chickens examined in Haromaya intensive poultry farm, the following types and species of ectoparasites were identified: a species of flea known as *E. gallinacea* (*Echidnophaga gallinacea*), a species of mite called *D. gallinae* (*Dermanyssus gallinae*) and four species of lice namely: *M. gallinae* (*Menopon gallinae*), *M. stramineus* (*Menacanthus stramineus*), *C. heterographus* (*Cuclotogaster heterographus*) and *L. caponis (Lipeurus caponis*) (Table 1).

Among the chickens examined, 135 were found to harbor lice. Thus, the overall prevalence of lice infestations was 35.1%. *L. caponis* was the most prevalent of the identified lice species, followed by *M. stramineus, M. gallinae,* whereas *C. heterographus* was the least prevalent species. Statistically significant difference

Table 1: Ectoparasites of chickens found in Haromaya intensive poultry farm

Common name	Order	Species of ectoparasites	Total Positives (%)	Site of attachments
Wing louse	Phthiraptera	*L.caponis*	75 (19.5)	Every part of the body
Body louse	Phthiraptera	*M.stramineus*	30 (7.8)	Base of feather
Shaft louse	Phthiraptera	*M.gallinae*	20 (5.2)	Thigh, wing, leg
Head louse	Phthiraptera	*C.heterographus*	10 (2.6)	Head, neck
Flea	Siphonaptera	*E.gallinacea*	23 (6.0)	Comb, wattle
Red mite	Acarina	*D.gallinae*	384 (100.0)	

Table 2: Prevalence of lice infestation based on their species

Species of lice	No of chickens infested	Prevalence (%) out of positives	[95% confidence Interval]	χ^2 (p-value)
L. caponis	75	55.6	47.2-63.9	3.940E2[a] (0.000)
M. stramineus	30	22.2	15.2-29.2	
M. gallinae	20	14.8	8.8-20.8	
C. heterographus	10	7.4	3.0-11.8	
Total	135	100		

Table 3: Prevalence of lice infestations based on host related risk factors

Hypothesized risk factors	Nº examined	Nº of positives (% out of examined)	[95% confidence interval]	χ^2 (p-value)
Sex				
Female	250	85 (34.0)	28.1-39.9	1.014[a]
Male	134	50 (37.3)	29.2-45.5	(0.908)
Total	384	135 (35.2)	30.4-39.9	
Age				
Young growers	160	46 (28.8%)	21.7-35.8	5.593[a]
Adult Chicken	224	89 (39.7%)	33.3-46.1	(0.232)
Total	384	135 (35.2)	30.4-39.9	
Breeds				
White leghorn	284	99 (34.9)	29.3-40.4	2.396[a]
Bovan brown	100	36 (36.0)	26.6-45.4	(0.663)
Total	384	135 (35.2)	30.4-39.9	

Table 4: Prevalence of flea infestations based on host related risk factors

Hypothesized risk factors	Nº examined	Nº of positives (% out of examined)	[95% confidence interval]	χ^2 (p-value)
Sex				
Female	250	14 (5.6)	2.8-8.5	0.193[a]
Male	134	9 (6.7)	2.5-11.0	(0.408)
Total	384	23 (6.0)	3.6-8.4	
Age, years				
Young growers	160	17 (10.6)	5.9-15.4	10.467[a]
Adult Chicken	224	6 (2.7)	0.57-4.8	(0.001)
Total	384	23 (6.0)	3.6-8.4	
Breeds				
White leghorn	284	21 (7.4)	4.4-10.4	3.822[a]
Bovan brown	100	2 (2.0)	-0.74-4.7	(0.035)
Total	384	23 (6.0)	3.6-8.4	

($P< 0.05$) was observed in the prevalence among the species of lice (Table 2). Analysis of host related risk factors with the prevalence of lice infestation did not show statistically significant variation ($P>0.05$) between sexes, age groups as well as between breeds of chicken (Table 3).

E. gallinacea was the only species of flea that showed up in 23 (6%) of the 384 chickens examined (Table 4). There was statistically significant difference ($P< 0.05$) in the prevalence of flea infestations between breeds as well as between the age groups of chicken.

All of the chickens examined (100%) were infested with mite. *D. gallinae* was the species of mite observed. Besides, 259 (67.4%) poultry were suffering from mixed infestations that are infested with one or more types and species of ectoparasites.

DISCUSSION

Our study revealed the presence of mite, lice and flea as the common types of ectoparasites in the intensive poultry farm studied. The observed overall prevalence of mite infestation was higher than that of lice or flea. All of the chickens examined suffered from mite infestation (*D. gallinae*) which indicates that mite infestation was the most common among the ectoparasites (Table 1). The different types and species of ectoparasites as recorded in this study are more or less similar to the previous studies [6, 13, 14, 15 and 16]. The observed level of ectoparasitism in our work might be associated partly with the poor hygienic practice and management system, which creates favorable environment for the propagation and life cycle progression of the diverse parasitic species in the farm.

Lice infestation was the second most common among the chickens examined. The overall lice infestation in this study (35.1%) was lower than the one reported by Belihu *et al*., [17] in Ethiopia (84.3%), Nnadi and George [18] in Nigeria (62.2%) and it was higher than the one reported by Sabuni *et al*., [19] in Kenya (14.5%). This could be due to the difference in the practices of ectoparasites control. While *L. caponis* being the most prevalent lice species identified, there was significant difference ($P< 0.05$) in the prevalence among the species of lice. This finding disagrees with the work of Belihu *et al*., [17], Zumani Banda [20] and Sychra *et al*., [21] who found *L. caponis* being the least prevalent as compared to other species of lice. With regard to the risk factors analyzed, the prevalence of lice infestation did not show statistically significant variation ($P>0.05$) between sexes, age groups as well as between the breeds of chicken examined (Table 2). With regard to sex as a risk factor, our work is in agreement with Sabuni *et al*., [19] who reported almost similar prevalence between males and females. In contrast to our finding, significant difference was reported between male and female by Belihu *et al*., [17] and Tolossa *et al*., [22] who reported that cocks are more infested than hens.

The overall prevalence of flea infestation observed in our study (6%) was by far less than the report of Belihu *et al*., [17] in Ethiopia, Swai *et al*., [23] in Tanzania and Nnadi and George [18] in Nigeria who reported 51.2%, 75.3% and 35.7% respectively. On the other hand the result of our work was higher than the one reported by Sabuni *et al*., [19] in Kenya (1.5%). The difference in hygienic and ectoparasite control practices might have played their role to such variations. According to the age group, our findings showed that older chicken were less infested by flea than young growers. This is in contrast to the study done in Zimbabwe by Permin *et al*. [6] and in Nigeria by Biu *et al*., [24], who reported that older chicken, were more infested as compared to younger ones. The significant variation ($P< 0.05$) in the prevalence of flea infestations between the age groups of chicken shown in our case might be associated with the difference in the body temperature between the age groups. Obviously, body temperature is inversely proportional to the body size; consequently, young growers might have got infested higher than the adult chickens as temperature favors the growth and propagation of ectoparasites. The difference in the degree of susceptibility to ectoparasites infestation between breeds, defense mechanism, high production capability and ecological adaptation might be the contributing factors to the variation observed in the prevalence of flea infestation between Bovan brown and White leghorn.

D. gallinae (the red mite), observed in our study is considered an ectoparasite of economic and public health importance. Mites were the most severe and widespread pests in the study site. As they are blood feeders and complete their entire life cycle on the bird, the infestations with mites might sternly results in reductions of feed conversion efficiency and may have a negative effect on some aspects of direct production such as egg size [25]. Besides, especially the mites also can be pests of people working with or around the hens. While all of the chickens examined in this study were infested by mite (100%), in contrast, there were reports from other parts of Africa such as in Nigeria by Nnadi and George [18], in Kenya by Sabuni *et al*., [19] and Zumani Banda, [20] in Malawi that mite infestation occurred in only 2.1%, 2.2% and 1.5% respectively of the studied chickens. The difference observed in the prevalence of mites in these areas might be associated with poor hygiene in the farm and chicken houses as well as lack of control measures towards such parasites. In addition, it might also be due to the type of poultry management systems. Arend [26] noted that management could be a contributing factor to the type of ectoparasites that are predominanting in chicken houses.

The infestation with one or more types and species of ectoparasites observed in our study was in accord with series of studies done by many researchers such as Abebe *et al*., [14], Belihu *et al*., [17] in Ethiopia, Swai *et al*., [24] in Tanzania, Sabuni *et al*., [19] in Kenya and Nnadi and George [18] in Nigeria. Another study demonstrated the infestation of rats with lice and flea which might imply the plausible contribution of rats as a

reservoir of ectoparasites in the areas where appropriate pest management is not regularly implemented [27]. The different species of ectoparasites identified in this study indicate the existence of diverse ectoparasite fauna in the study sites. Taking their life cycle and their direct and indirect effects on the chicken, the mixed infection obviously affects the performance of the sector.

CONCLUSIONS AND RECOMMENDATIONS

Mite, lice and flea were the common types of ectoparasites in the study site. The observed overall prevalence of mite infestation was higher than that of lice or flea. All of the chickens examined suffered from mite infestation, thus mite was the most common ectoparasite infestation. Among the species of lice identified, *L. caponis* was the most prevalent. Finally, the observed results of our study suggest that appropriate ectoparasite control measures have to be practiced to mitigate the effect of infestation by poultry pests.

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