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Investigation of Ectoparasites of Local Scavenging Chickens in Asella, Arsi Highland of Oromia Regional State, Ethiopia

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Abstract: The present study was conducted from October 2019 to February 2020 to estimate the prevalence of ectoparasites of indigenous scavenging chickens raised under traditional management system in and around Asella, Arsi highlands of Oromia regional state Ethiopia. A total of 100 indigenous scavenging chickens comprising of different age groups and both sexes were purchased and examined for the presence of ectoparasites. This study disclosed overall prevalence of 80% infestation by diverse species of ectoparasites among the examined indigenous chickens. Parasitic examination revealed the presence of nine species of ectoparasites (fleas, lice and mites). Six species of lice *Menacanthus stramineus* (46%), *Menopon gallinae* (29%), *Gonocoites gallinae* (20%), *Cuclotogaster heterophagus* (15%), *Lipeurus caponis* (12%) and *Gonogoides gigas* (9%), two species of mange mite *Knemidocoptes mutans* (12%) and *Cytoditus nudus* (2%) and single species of flea *Echidnophaga gallinacea*(30%) were identified. Statistical analysis of the results revealed that there was significant difference ($P<0.05$) in the prevalence of ectoparasites between the age categories. The prevalence of ectoparasites infestation was higher in males (46%) than females (34%), although the difference was not statistically significant ($P>0.05$). In conclusion, the problem of infestation with ectoparasites of indigenous scavenging chickens was important constraint in poultry production sector in traditional backyard management system. This might be associated with lack of due attention with respect to hygienic system (poor management), treatment and control strategies. Therefore, application of integrated control strategy, good management practices, creation of awareness and further detailed investigations are recommended.

Key words: Asella · Arsi · Ectoparasites · Indigenous Chickens · Prevalence

INTRODUCTION

Ethiopia is endowed with 56.87 million poultry [1]. In Ethiopia indigenous chickens managed under traditional management system contribute to poverty alleviation with a decent livelihood through of eggs for hatching, sale and home consumption and production of birds for sale, processing, replacement and home consumption [2]. Moreover, chickens play important socioeconomic roles in developing countries by provision of animal protein, generation of extra cash incomes and religious/cultural considerations are amongst the major reasons for keeping village chickens by rural communities [3-6]. Thus rural poultry production represents a significant part of the rural economy as a source of income for small holder farmers [7].

In Ethiopia, the traditional poultry production system is characterized by minimum or nearly zero inputs from the owners. Indigenous chickens get some leftovers, grain feeds and household wastes. Breeding takes place naturally and there is no standard housing for indigenous chickens. In most instances, the indigenous chickens share the same house with their owners at night [2]. The main constraints to the development of indigenous chicken production in rural Ethiopia include disease, predation, lack of feed, housing and poor management.

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Among the diseases that significantly cause impact on productivity of indigenous chickens, parasitic diseases come first [7].

Endo and Ecto- parasites remain abundant and wide spread in the tropics owing to the poor management and husbandry coupled with favorable climatic conditions for the development of the parasites [8]. Ectoparasites are known for transmitting a number of infectious diseases by acting as transport/ intermediate hosts of a range of different diseases [3].They can inhibit the skin or outgrowths of the skin of the host organism for various periods [9]. Some are blood suckers while others burrow in the skin or live on or in the feathers. Ectoparasites, such as lice, ticks, mites and fleas, live on domestic chickens. Mites have long been recognized as a cause of dermatitis and skin damage on all classes of poultry [10].

Even though, parasitic diseases are among the major causes that decrease productivity of chickens, they are often neglected, as they are rarely lethal. Although poultry diseases are known to cause marked economic loss, few studies have been done on ectoparasites of indigenous scavenging chickens in Ethiopia. Thus, the current study was undertaken with the objectives of investigating the occurrence of ectoparasites of indigenous scavenging chickens, identifying their species and associated risk factors in and around Asella, Arsi highlands of Oromia regional state, Ethiopia.

MATERIALS AND METHODS

Study Area: The present study was conducted in Asella, located in the highlands of Arsi zone of the Oromia Regional State about 175 kilometers from Addis Ababa, the capital city. Asella has a latitude and longitude of 7°57'N and 39°7'E, with an elevation of 2, 430 meters. The annual mean rainfall ranges from 2000 to 4000 mm and annual ambient temperature varies from 20°C to 30°C [1].

Study Animals and Management: The populations of interest were indigenous scavenging chickens maintained under traditional small holder extensive management production system. A total of 100 indigenous scavenging chickens apparently healthy including both sexes and different age groups were purchased from local open-air markets in and around Asella. Purchased chickens were then transported to Asella Regional Veterinary Laboratory for detailed laboratory and postmortem based examination.

Study Design, Sample Collection and Examination Protocol: A cross-sectional study design was conducted from October 2019 to February 2020 on 100 indigenous scavenging chickens in Asella, the highlands of Arsi zone of the Oromia Regional State Ethiopia. After performing euthanasia, the skin of the chickens including the feathers and legs was separated from the underlying integument. Then the collected sample was properly kept in a plastic bag with the aim of preventing the escape of the available ectoparasites. Besides, the legs and featherless areas of the body of the chickens with any seborrhea or crustation were scrapped for microscopic examination. Following, evisceration was done and particularly the thoracic cavity was opened. The air sacs were closely visualized and inspected to examine the presence of air sac mites. The encountered external parasites were collected and preserved in 70% ethanol for eventual identification. The identification of collected external parasites was carried out based on the morphological features described by Wall and Shearer [11].

Data Analysis: All collected data were entered into Microsoft excel sheet and then analyzed by STATA version 4, 2015. The prevalence was calculated as a percent of infected poultry from the total number of poultry examined. Difference in prevalence by explanatory variable (sex and age) was investigated by Pearson's chi-square (χ^2) and logistic regression was applied to assess association of different variables. A difference was taken as statistically significant at a p-value less than 0.05 and the confidence level was held at 95%.

RESULTS

Out of 100 indigenous chickens examined, 80% were found infested different types of ectoparasites. Accordingly, nine different species of ectoparasites lice were encountered in the present study representing six, two and one species of lice, mange mites and flea, respectively (Table 1).

The ectoparasite fauna of examined indigenous scavenging chickens in the study area was marked by the presence of one flea species (*Echidenophaga gallinacea*), two mange mites species (*Knemidocoptes mutans* and *Cytoditus nudus*) and six species of lice (*Menacanthus stramineus*, *Menopon gallinae*, *Goniocotes gallinae*, *Cuclotogaster heterographus*,

Table 1: Ectoparasites of indigenous savaging chickens identified in Asella, Arsi highlands of Oromia Regional State Ethiopia

Ectoparasites species	Prevalence
LICE	
Menacanthus stramineus	46%
Menopon gallinae	29%
Gonocoites gallinae	20%
Cuclogaster heterophagus	15%
Lipeurus caponis	12%
Gonogoides gigas	9%
FLEA	
Echidnophaga gallinacean	30%
MANGE MITES	
Knemidocoptes mutans	12%
Cytoditus nudus	2%

Table 2: The prevalence of ectoparasites of indigenous scavenging chickens on the basis age and sex groups encountered in Asella, Arsi highlands of Oromia Regional State Ethiopia

Risk factors	Categories	Number examined	Number of positive	Prevalence	P-value
Age	Young	30	17	17%	0.000
	Adult	70	63	63%	
Sex	Male	45	46	46%	0.84
	Female	55	34	34%	

Table 3: Ectoparasites of indigenous savaging chickens identified in Asella, Arsi highlands of Oromia Regional State Ethiopia

	Number Positive and Prevalence			
	Sex		Age	
Ectoparasites species	Male	Female	Adult	Young
LICE				
Menacanthus stramineus	25 (54.3%)	21 (45.7%)	37 (80.4%)	9 (19.6%)
Menopon gallinae	37 (80.4%)	9 (19.6%)	27 (93.1%)	2 (6.9%)
Gonocoites gallinae	11 (55%)	9 (45%)	18 (90%)	2 (10%)
Cuclogaster heterophagus	8 (53.3%)	7 (46.7%)	9 (60%)	6 (40%)
Lipeurus caponis	7 (58.3%)	5 (41.7%)	8 (66.7%)	4 (33.3%)
Gonogoides gigas	5 (55.5%)	4 (44.5%)	5 (55.5%)	4 (44.5%)
FLEA				
Echidnophaga gallinacean	16 (53.3%)	14 (46.7%)	23 (76.7%)	7 (23.3%)
MANGE MITES				
Knemidocoptes mutans	7 (58.3%)	5 (41.7%)	12 (100%)	0
Cytoditus nudus	1 (50%)	1 (50%)	2 (100%)	0

Lipeurus caponis and *Goniodes gigas*). The major ectoparasites identified in all the three study areas were lice and mites, locally known as Kenken. There was no tick species identified during this study.

In this study, two possible risk factors namely age and sex were also assessed and the result was as indicated here in Table 2.

Among the two age categories the highest ectoparasites prevalence was recorded in adult 63% compared to young chickens 17%. There was a statistically significant difference ($P<0.05$) between the prevalence of ectoparasites and age groups. However, there was no statistically significant difference ($P>0.05$) between the prevalence of ectoparasites and sex groups female (46%) versus male (34%) (Table 2).

Of all the ectoparasites recovered *Menacanthus stramineus* occurred with highest overall prevalence of 46 (46%), followed by *Menopon gallinae* 29 (29%). *Cytodites nudus* 2 (2%) was the least identified. *Knemidocoptes mutans* 12 (12%) was the other mange mite recorded during this study (Table 3).

The occurrence of *Menacanthus stramineus* was higher in adult chicken 37 (80.4%) than in young 9 (19.6%). The difference was statistically significant ($P<0.005$). The prevalence of *Menopon gallinae* was higher in adult chicken 27 (93.1%) than young groups 2 (6.9%) and *Gonocoites gallinae* higher in adult 18 (90%) than young 2 (10%). Statistical analysis showed the existence of statistically significant difference ($P<0.05$) for both *Gonocoites gallinae* and *Menopon gallinae* with

respect to age categories. The prevalence of flea was found to be higher in adult chicken 23 (76.7%) than young 7 (23.3%) with statistically significant difference (P<0.05). *Knemidocoptes mutans* as well as *Cytoditus nudus* the two mange mites encountered in the present study were absent in young groups of chickens. Accordingly, there were statistically significant differences (P<0.05) between the prevalence of *Knemidocoptes mutans* and *Cytoditus nudus* with regard to age of the examined chickens. However, there were no statistically significant differences (P<0.5%) in the prevalence of *Knemidocoptes mutans* and *Cytoditus nudus* with regard to sex of examined chickens. There was no statistically significant difference (P>0.05) in the prevalence of all ectoparasites with regard to sexes of the chickens (Table 3).

DISCUSSION

The present study revealed the existence and occurrence of various ectoparasites in ingenious scavenging chickens in Asella, Arsi highlands of Oromia Regional State Ethiopia. The overall prevalence of ectoparasites was found to be 80%. Such high prevalence of ectoparasitism is attributed to the nature of the husbandry and management practices that exist in the traditional low input production system as well as to the conducive environmental factors favoring the propagation and life cycle progression of the diverse parasite fauna in the studied sites.

The high overall ectoparasites prevalence (80%) reported in the present study may be linked with the free rearing of chickens, which exposes them to various ectoparasites where lice infestation was found to be outstanding. These findings were consistent with the results of previous studies performed in Ethiopia. African and Asian countries: 93.7% from selected sites of central Ethiopia [12]; 91.5% from central Ethiopia [13]; 84% from Tanzania [14]; 83.85% in Mareka district southern Ethiopia by Wondimu [15]. In other studies relatively lower prevalence reports were noted. For instance, 52.8% from Iran [6]; 40% from Wolaita zone southern Ethiopia [16] and 41.1% from south-eastern Nigeria village [17]. The differences in prevalence may be attributed to differences in management system, breed of chickens examined, geographical areas, sample size and period of study. In addition, it might be associated with the poor hygienic practice in rural regions, which creates a favorable environment for parasites and the free-range system.

In this study there was a statistically significant difference (P<0.05) in the prevalence of ectoparasites in adult (63%) as opposed to young chickens (17%). This might be due to the longer exposure of adult chicken to the infested environment. This association agreed with the findings of earlier studies that revealed adults found to be more infested than young age chickens [18, 19]. The present finding of higher ectoparasites prevalence among adult chickens was in agreement with the previous findings 86.4% and 100%, respectively [20, 21]. Similarly, a report from Bangladesh revealed that adults chickens to be more infested with ectoparasites than young chickens [22]. However, the current result was not in alignment with the previous findings which disclosed higher ectoparasites prevalence in young chickens 74.5% [23], 61.8% [24] and 66.3% [6]. In general the differences among the findings might be due the variations in the study methods, agro-climatic condition of the research, immune response of the poultry to ectoparasitic infestation, implemented methods of disease control and/or prevention and management systems applied.

In current study six species of lice were encountered. Among the identified ectoparasites species, *Menacanthus stramineus* (46%) was most frequently identified species. This result was slightly higher than previous report of 33.5% [25].However this finding is lower than previous reports 65.5% recorded by Hagos and Eshetu [12] and 71.5% recorded by Belihu [13].

Echidinophaga gallinacea (stick tight flea) was found to be the second most prevalent ectoparasites in the present study with a prevalence of 30%. The present finding was much lower than previous reports: 83.54% from Ethiopia [15], 76.7% from Kenya [8] and 83.5% from northern Tanzania [14].

This study revealed mange mites *Knemidocoptes mutans* (12%) and *Cytoditus nudus* (2%) in the current study area. The prevalence of *Knemidocoptes mutans* (12%) was closer to the report from Kenya 13.3% and Jimma Ethiopia 11.9% [8, 26]. *Knemidocoptes mutans* is known to cause scaly legs having a characteristic thickened leg with scaly nature and marked keratinisation.

The findings of the present study disclosed *Cytoditus nudus* (air sac or respiratory system mange mites of poultry) with an overall prevalence of 2%. This was found to be lower than the previous report of 12.6% from selected sites of central Ethiopia [12]. The present study disclosed that indigenous scavenging chickens had multiple ectoparasites infestations up to nine species, which is expected to seriously affect their health status and productivity. Due to the inherent nature of husbandry and management practices of indigenous scavenging chickens in most parts of the

country including Asella, ectoparasites are widely spread and significantly exert their confounding influences on productivity [27]. Application of parasite control schemes must thus receive priority attention. Moreover, the prevailing situation is exacerbated by absence of animal health care extension services in the study area. Further coordinated efforts need to be designed and implemented towards envisaging rural poultry management packages addressing improved health care, supplementary feed provision and housing facilities.

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ANNEX: Photos of Ectoparasites Taken During Laboratory Examination

Fig. 1: Menacanthus stramineus

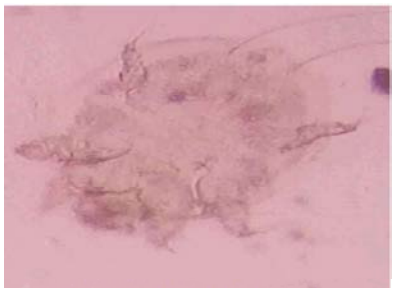

Fig. 2: Knemidocoptes mutans

Fig. 3: Menapoon gallinae

Fig. 4: Gonocoites gallinae

Fig. 5: Lipeurus caponis

Fig. 6: Gonogoides giggas

Fig. 7: Echidenopaga gallinacea