

Prevalence of ectoparasites in backyard local chickens in three agroecologic zones of East Shoa, Ethiopia

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SUMMARY

A study was carried out to determine the prevalence of ectoparasites and identify the species of ectoparasites in backyard local chickens in three different agro-ecological areas namely highland, midland and lowland. Out of 600 local chickens examined, 549 (91.5%) chickens were found to harbor ectoparasites. There was no significant difference ($P > 0.05$) observed in the prevalence of ectoparasites among the study sites while significantly higher prevalence ($P < 0.05$) was observed in male (94.35%) than female (88.7%) chicken. Nine different species of ectoparasites were identified during this study: *Echdinophaga gallinacea*, *Amblyomma* spp., *Argas persicus*, *Menopon gallinae*, *Menacanthus stramineus*, *Gonoides gigas*, *Gonicotes gallinae*, *Cuclotogaster hetrographa* and *Lipeurus caponis*. *Menacanthus stramineus* (65.5%) was the most prevalent ectoparasite identified followed by *Echdinophaga gallinacea* (51.3%).

Keywords: Agro-ecology, Chickens, Ectoparasites, Prevalence.

RÉSUMÉ

Prévalence des ectoparasites sur les volailles de basse-cour dans 3 régions agro-écologique de l'Est Shoa (Ethiopie)

Cette étude avait pour objectif de déterminer la prévalence et la nature des ectoparasites présents sur des volailles de basse cour dans trois régions d'Éthiopie présentant des différences agro-écologiques: les hautes terres, les terres centrales et les basses terres. Aucune différence significative n'a été observée en ce qui concerne la prévalence des ectoparasites ($P < 0.05$) entre les trois régions étudiées. Par contre, une prévalence significativement plus élevée a été observée chez les mâles (94,35 %) par rapport aux femelles (88,7 %). Neuf espèces différentes de parasite ont été identifiées au cours de l'étude : *Echdinophaga gallinacea*, *Amblyomma* spp., *Argas persicus*, *Menopon gallinae*, *Menacanthus stramineus*, *Gonoides gigas*, *Gonicotes gallinae*, *Cuclotogaster hetrographa* et *Lipeurus caponis*. *Menacanthus stramineus* était le parasite le plus fréquent (65,5 %) suivi par *Echdinophaga gallinacea* (51,3 %).

Mots clés : Agro-écologie, volailles, ectoparasites, prévalence.

Introduction

In developing countries, there are 6 billions poultry under different production systems. In Africa, about 80% of the poultry populations are found in traditional production system [9]. Ethiopia has 42 millions poultry population excluding pastoral and agro-pastoral areas [6]. Though there is a trend of increase in large and small-scale commercial poultry production in the country, still the predominant system of poultry production remains to be the backyard system.

The traditional backyard poultry production system in Ethiopia effectively operates with practically no input. Yet the annual output of poultry meat and egg contributed by local chickens are 72,300 and 78,000 metric tons, respectively [3]. In addition, the role of poultry as a regular source of cash income for rural communities and contribution to the fulfillment of protein need at a ration scale is significant [3].

However, in recent years intensive extension activities are underway particularly in distributing improved breeds of chicken to smallholder farmers in different parts of rural Ethiopia. The anticipated rationale of such activities is to increase productivity of chicken under traditional management system. Nevertheless, the performance of the newly

imported chickens is heavily dependent among other factors on the management system in which they are kept and their potential to resist the diverse disease conditions prevailing in this environment [13]. Of the diseases that reduce productivity of rural poultry, diseases caused by endoparasites and ectoparasites are among the most important. In Ethiopia, a few studies have been carried out with regard to the prevalence of ectoparasites in different areas [4, 10, 11, 20]. However, these studies were either neglecting backyard chickens or were limited to prevalence study.

The present study was undertaken with the objectives of determining the prevalence rates of ectoparasites and identifying the species of ectoparasites in backyard chickens in three agroecologies in East Shoa Zone of Oromia, Ethiopia.

Materials and Methods

STUDY AREAS

This study was conducted on backyard chickens obtained from in and around three selected areas of East Shoa Zone, Akaki (highland), Debrezeit (midland), and Nazareth (lowland) from November 2007 to June 2008.

Akaki

Is located at 8° 9' N Latitude and 38° 8' E longitude, 27 km South of Addis Ababa at an altitude of 2120 meter above sea level with an average annual rainfall of 1200 mm and average annual maximum and minimum temperatures of 20°C and 18°C, respectively [14,16]. The population of backyard chicken in the area was estimated around 31,000 [6].

Debrezeit

Is located at 8° 44' N latitude and 38° 57' E longitudes, 47 km South East of Addis Ababa at an altitude of 1950 meter above sea level with average annual range of 11.8°C to 26.9°C and annual average rainfall of 851mm. The population of backyard chickens in the area is approximately 71,000 [6].

Nazareth

Is located about 100 km south east of Addis Ababa at 39.17° N and 8.33° E, with altitude of 1622 meter above sea level. It has an average annual temperature range from 13.9 to 27.7°C and the annual rainfall reaches 830.8 mm of which 66% occur during the long rainy season [14, 15]. The population of backyard chickens in the area is approximately 91,000 [6].

STUDY POPULATION AND SAMPLING PROCEDURE

The target populations were the local backyard non vaccinated back yard chicken in the study areas. The sample size was determined based on the formula provided by Thrusfield (1995) [18].

$$N = \frac{1,96^2 * p_{exp} * q}{d^2}$$

Where, N = sample size required
 P_{exp} = expected prevalence
 q = 1 - p_{exp}
 d = desired absolute precision

In this formula expected prevalence of 50% and absolute precision of 95% were considered. Accordingly, a total 384 chickens were required for this study. However, a total of 600 chickens were purchased from local markets in the three agro-ecological zones (200 from each agro-ecology) to increase the precision of the study. While purchasing the chicken, observation of the physical appearance of chicken and short interview of owners about origin and breed of chickens was made to select those originating from the specific agroecology and exclude exotic and hybrid chickens. Proportional samples of the two sexes were included during purchasing.

COLLECTION AND IDENTIFICATION OF ECTOPARASITES

The studied chickens were bought from local markets of each study sites and killed by manual dislocation of the neck,

which was done by holding the birds by its feet and pulling neck downwards and bending it sharply backwards [17].

Immediately after sacrificing, the skin from individual birds was medially incised, detached from the underlying tegument and was kept in a blue plastic bag together with the feather for preventing the escape of ectoparasites. Collection of external parasites from chicken was carried out by carefully examining the entire external body parts. The legs and featherless areas of the body with any seborrhea or crustation were scraped for microscopic examination. Ectoparasites from each bird were collected and preserved in 70% ethanol for identification. In addition, any ectoparasite which was visible in live chickens was collected using thumb forceps.

DATA ANALYSIS

The data collected was stored and prevalence rates was calculated using Microsoft Excel and further analysis for effects of risk factors such as sex and agro ecology was done by Chi-Square test and *P-values* < 0.05 were considered as significant.

Results

Out of the total 600 local chickens examined for ectoparasite infestation, 549 (90.2%) chickens were found harboring ectoparasites.

The ectoparasites fauna of examined local chicken during dry season in different agro ecological zones was marked by the presence of one flea (*Echidnophaga gallinacea*) and two tick species (*Amblyomma* spp. and *Argas persicus*) and six species of lice (*Menopon gallinae*, *Menacanthus stramineus*, *Goniodes gigas*, *Goniocotes gallinae*, *Cuclotogaster heterographa* and *Lipeurus caponis*) (Table 2).

SEX AND SITE PREVALENCE INTERACTION

There was no significant difference observed in the prevalence of ectoparasites among the three agroecologies except for tick infestation with high prevalence in Nazareth (14%) and the least prevalence of tick infestation in Debre-zeit (3.5%). Significant differences in lice infestation and mixed infestation between the two sexes of study animals were also observed (Table 3).

There was no significant difference in the prevalence rates of ectoparasite infestations among the three agroecologies (Akaki = 92.5%, Debre Zeit = 90% and Nazareth = 92%). However, the prevalence rates of ectoparasites infestation in male (94.3%) was significantly higher than that of female chickens (88.7%) (Table3).

LICE INFESTATION

Of the total 600 local chickens examined, 84.3% were found to harbor lice. The fauna of lice infestations of local chickens generally revealed six major species namely

Study area	No. examined			No. Infected			Prevalence (%)		
	M	F	Total	M	F	Total	M	F	Total
Akaki	100	100	200	96	89	185	96	89	92.5
Debre Zeit	100	100	200	91	89	180	91	89	90
Nazareth	100	100	200	96	88	184	96	88	92
Total	300	300	600	283	226	509	94.3	88.7	90.2

M= male, F=Female

TABLE I : The overall prevalence of ectoparasites infestation in backyard local chickens of three agro climatic zones of East Shoa.

Ectoparasites	Prevalence									Overall
	Akaki			Debre Ziet			Nazareth			
	M	F	B	M	F	B	M	F	B	
<i>E. gallinae</i>	53	48	50.5	48	48	48	55	55	55	51.16
<i>A. perisicus</i>	4	6	5	0	0	0	8	14	11	5.33
<i>Amblyomma spp.</i>	1	1	1	6	14	10	9	0	4.5	5.16
<i>M. gallinae</i>	1	0	0.5	36	34	35	19	28	23.5	19.66
<i>M. stramineus</i>	67	63	65	76	63	69.5	69	54	61.5	65.33
<i>G. gigas</i>	26	15	20.5	11	11	11	37	14	25.5	19
<i>G. gallinae</i>	2	4	3	2	0	1	0	1	0.5	1.5
<i>C. hetrographa</i>	42	10	30.5	28	11	19.5	26	24	25	25
<i>L. caponis</i>	0	0	0	0	1	0.5	3	0	1.5	0.67

M= Male, F=Female, B= Both

TABLE II : Ectoparasite fauna identified in backyard local chickens in three agroecological zones of East Shoa.

Factors	Prevalence									
			Lice		Flea		Tick		Mixed	
			No. +ve	%	No. +ve	%	No. +ve	%	No. +ve	%
Site	Akaki	200	172	86	101	50.5	12	6	140	70
	Debre Zeit	200	166	83	96	48	7	3.5	123	61.5
	Nazareth	200	168	84	111	55.5	28	14	139	69.5
Chi-square test result			X ² =0.71 P=0.70		X ² =2.34 P=0.31		X ² =16.67 P=0.00		X ² =4.12 P=0.13	
Sex	Male	300	267	89	157	52.3	25	8.3	231	77
	Female	300	239	79.7	151	50.3	23	7.67	182	60.67
Chi-square test result			X ² =9.89 P=0.002		X ² =0.24 P=0.62		X ² =0.09 P=0.76		X ² =18.65 P=0.00	
Total		600	506	84.3	308	51.3	48	8	413	68.3

No +ve: positive animals

TABLE III : The effect of sex and site on the prevalence of ectoparasites in backyard local chickens of three agroecological zones in East Shoa

Menopen gallinae, *Menacanthus stramineus*, *Goniodes gigas*, *Goniocotes gallinae*, *Cuclotogaster hetrographus* and *Lipeurus caponis*. Among the identified lice species, *M. stramineus* was the most prevalent (65.3%) species followed by *C. hetrographus* (25%) and *M. gallinae* (19.6%) (Table 2).

FLEA INFESTATION

Out of the 600 chickens examined, 51.3% had flea infestation. There was no statistically significant difference ($P > 0.05$) on the prevalence rates of flea infestations among the three agroecologies and between male and female chickens exa-

mined. The fauna of flea infections of local chickens revealed only one species namely *Echidnophaga gallinacea*.

TICK INFESTATION

Out of the 600 chicken examined, 48 (8%) had tick infestation. There was statistically significant difference ($P < 0.05$) on the prevalence rates of tick infestations among the three agro ecologies but no difference was observed in the prevalence rates of ticks between male and female chickens. The highest prevalence rate of tick infestation was observed in Nazareth (14%), while the least prevalence rate was found in Debre Zeit (3.5%). This might not represent the actual figure, since the parasites live on the hosts for a short period of time and usually at night [19].

Discussion

The observed overall prevalence rate of ectoparasites (90.2%) in backyard local chickens from the three agroecological zones was considerably high, which indicates that ectoparasite infestation is a common problem in the study sites. This high prevalence of ectoparasitism may be associated partly with the poor hygienic practice in the backyard management system, which creates conducive environment for the propagation and life cycle progression of the diverse parasitic fauna in the studied sites. The high parasitic fauna has direct or indirect effects on the productivity of local chickens. This high prevalence rate of ectoparasite infection of local chickens was recorded in the dry season (November to May) in all the three studied agroecologies. Prevalence rates up to 100% ectoparasite infection were also reported previously [11] during rainy season (June to September) in the study sites (96% in highland, 100% in the mid-altitude and 96% in the lowland). BERSABEH [4] reported different prevalence rates in the dry season (78% in the highland, 100% in the mid-altitude and 93.8% in the lowland). Another study carried out in central Ethiopia by HAGOS [10] recorded a prevalence rate of 93.7%. Another study carried out in Eastern lowlands (Dire Dawa) in Ethiopia by GEDION [8] found ectoparasites prevalence of 100%. YACOB *et al* [20], also reported an over all prevalence of ectoparasitism in three agroecologies of Oromia regional state with no significant difference in the frequency of occurrence of ectoparasites among the study sites.

The ectoparasites identified during this study include: *Echidnophaga galinacea* (51.3%), *Amblyomma* (4.3%), *Argas persicus* (5.3%), *Menopon gallinae* (19.7%), *Menacanthus stramineus* (64.8%), *Goniodes gigas* (18.8%) *Goniocotes gallinae* (1.3%), *Cuclotogaster hetrographa* (25%) and *Lipeurus caponis* (0.8%). It is usually difficult to report the actual prevalence rates of *Argas persicus* and mites because they commonly visit briefly the host for blood meal usually at night. This result is in agreement with the report of HAGOS [10] and BERSABEH [4] in central Ethiopia; ABEBE *et al* [1] in and around ADDIS ABABA and GEDION [8] in Dire Dawa.

The predominant ectoparasite identified during this study was *M. stramineus* (64.8%). This louse is the most pathogenic

species of poultry lice as it causes severe anemia by feeding on blood that oozes out. It also results in inflammation of skin and extensive scab formation [10] and this work further reported that external lesions such as crust formation and loss of feathers were noted on birds infected with *M. stramineus*. However this figure is lower than previous reports [11] (99.3%), [10] (71.5%) and [4] (87.2%) in central Ethiopia, but it is higher than the reports of GEDION [8] (51.2%) and ABEBE *et al* [1] (26.6%) and YACOB *et al* (40%) in Dire Dawa, in and around ADDIS ABABA and OROMIA regional state respectively.

Generally, nine species of ectoparasites were identified in the present study indicating the existence of diverse ectoparasite fauna in the study sites. Considering the life cycle of these parasites and the damage inflicted on chicken by, it is easy to imagine the direct and indirect effects of the parasites on the performance of backyard chicken. Thus, practice of good hygienic measures and regular use of treatment against ectoparasites are major area of intervention in this sub sector of farming.

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