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Study on Prevalence of Ectoparasites in Poultry Managed Under Backyard System in Mareka Woreda of Dawuro Zone, Snnpr, Ethiopia

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Abstract: *A cross sectional study was conducted from November 2010 to April 2011 to identify and estimate the prevalence of ectoparasites of poultry managed under backyard system in Mareka Woreda of Dawuro zone, SNNPR. A total of 384 chickens of different age groups and both sexes were examined. Overall, 322/384 (83.85%) of chickens were infested with one or more species of ectoparasites that mainly grouped into flea 269 (83.5%), lice 109 (33.85%) and fowl tick 16 (4.97%. Seven species of ectoparasites were identified. Among them, Echidnophaga gallinaaen (stick tight flea) 269/384 (83.5%) was the most prevalent ectoparasite species followed by lice species (Menopon gallinae 49/109 (44.95%), Menacanthus stramineus 22/109 (20.18%, Lipeurus caponis 17/109 (15.6%), Goniocotes gigas 14/109 (12.84%), and Goniocotes gallinae 7/109 (6.42%)) while the least identified was fowl tick (Argas persicus) 16/384 (4.97%). Mixed infestation 64/322 (19.87%) and single infestation 258/322 (80.12%) of ectoparasites was also recorded. The difference in prevalence rate of ectoparasites in brooder (44.41%) was higher than the adult (13.66%). The finding in age group showed that there was a significant difference in prevalence of ectoparasites between brooder and adult chicken (p<0.05). The difference in prevalence rate of ectoparasites in female (64.90%) higher than that of the male (35.09%). There was a significant difference (P<0.05) in infestation rate of ectoparasites between two sexes. Generally, the study indicated that the external parasites are highly prevalent in backyard chickens in the study area, which is associated with lack of due attention with respect to hygienic system, treatment and control practices. Therefore, control of ectoparasites should be based on creation of awareness to the community on the overall effect of ectoparasites on productivity of poultry.*

Keywords: *Backyard, Ectoparasites, Mareka, Poultry, Prevalence*

Abbreviations: *% - Percentage, Km- kilo meter, Mm – Millimeter, No – Number, oC - Degree Celsius, P – Prevalence, SNNPR - South Nation Nationality People Region*

1. INTRODUCTION

Poultry has influenced man civilization in many ways. Eggs and meat of birds are being consumed since prehistoric time. Compared to eggs there is no other single food of animal origin which is eaten relished by so many people in the world and none is served in such a variety ways. Its popularity is justified not only because it's so easily procured and has so many uses in cooking but also because it is almost unsurpassed product in nutritive excellence. Poultry meat is also used extensively as a delicious food (Singh, 2002).

Rural poultry production is an integral part of a balanced farming system and has a unique position in the rural house hold economy, supplying high quality protein to the family. In addition to their contribution to high quality animal protein and as a source of easily disposable income for farm house holds, rural poultry integrate very well and in a sustainable way into other farming activities, because they require little in the way of labor and initial investment compare to other farm activities (Tadelle and Ogle, 1996). It is also reported that rural poultry play a significant role through their contribution to the cultural and social life of rural people (Sonaiya, 1990).

In Ethiopia, rural poultry production represents a significant portion of the rural economy, as a source of income for small holder farmers (ILCA, 1993). The total poultry population of Ethiopia is estimated at 39.6 million (CSA, 2009). The majority (99%) of these chickens are maintained under traditional system with little or no inputs for housing, feeding or health care. Rural chicken in Ethiopia represents a significant part of the national economy in general and the rural economy in particular and

contributes 98.5 and 99.2% of the national egg and chicken meat production respectively (Fisseha *et al*., 2010) with an annual out put of 72,300 metric tons of meat and 78,000 metric tons of eggs (ILCA, 1993).

Indigenous fowl reared under traditional extensive (rural scavenging) system and or improved traditional (semi scavenging) production system constitute one of the important component of rural economy (Mir *et al*., 1993). However, the traditional poultry production system is characterized by low input, low output and periodic destruction of a large portion of the flock due to disease out-breaks. Among the infectious diseases, Newcastle disease, Salmonellosis, coccidiosis and sometimes fowl pox are considered to be the most important cause of mortality to the local chickens (Alamargot, 1987) while predators are an additional source of loss. Traditional backyard poultry husbandry exposes chickens to many types of parasites. Hence, most of the studies conducted in the different parts of Ethiopia have indicated that the proportion of chickens affected by both external and gastro intestinal parasites is high (Awoke, 1987, Eshetu and Tilahun, 2000).

Parasitic infestations are ubiquitous and infection load results in clinical disease. Ectoparasites are regarded as a basic cause of retardation in growth, lowered vitality and poor condition of birds. They can affect bird health directly by causing irritation, discomfort, tissue damage, blood loss, toxicosis, allergies and dermatitis which in turn reduce quality and quantities of meat and egg production. Also they act as mechanical or biological vectors transmitting numbers of pathogens (Mir *et al*., 1993).

There are several types of arthropods that constitute the major ectoparasites of poultry primarily lice, bugs, fleas, mites and ticks. The degree and types of infestation is markedly influenced by the production method. They live on or in the skin and feathers. They are characterized by possession of externally segmented bodies, jointed appendages, and chitinous exoskeleton (Calneck, 1997). Detection is important and easier for those parasites living on the birds (Northern fowl mites, hard ticks and stick tight fleas) than for those that are attached temporarily only for feeding (bedbugs, chicken mites, and soft ticks) (Michael, 1999).

The order *Hemiptera* (bug) includes several blood sucking parasites of birds. The most wide spread of these bugs is the common bed bug (*Cimex lectularius*) which attacks humans, most other mammals and poultry. It is most prevalent in temperate and subtropical climates. Poultry house and pigeon may become heavily invaded (Calneck, 1997).

Fleas (order *Siphonaptera*) are parasites in the adult stages, but free living as larvae. Adults vary in size, possess a tough laterally compressed body, piercing-sucking mouth parts, short antennae in grooves and long legs adapted for leaping. Fleas are brown to black in color (Calneck, 1997). The stick tight flea (*Echidnophaga gallinacean*) is unique among poultry fleas in that the adult become senssile parasites and usually remain attached to the skin of the head for days or weeks. The adult females forcibly eject their eggs so that they reach surrounding litter. The larvae develop best in sandy, well drained litter. Hosts of the adult fleas include chickens, turkeys, pigeons, humans and other mammals. Irritation and blood loss may cause anemia and death, particularly in young birds (Kahn, 2005).

Lice are common external parasites of birds which belong to the order *Mallophagia*, the chewing lice and are characterized by possession of chewing type of mandibles located ventrally on the head, incomplete metamorphosis, no wings, dorsoventrally flattened body and short antennae with three to five segments (Calneck, 1997).

The most common and economically important louse to both chickens and turkeys is *Menacanthus stramineus*, the chicken body louse. It punctures soft quills near their base or gnaws the skin at the base of the feathers and feeds on the blood. Chickens are less commonly infested with *Menopon gallinea* (on feather shafts), *Lipeurus caponis* (mainly on the wing feathers), *Cuclogaster hetrographus* (mainly on the head and neck), *Goniocotes gallinea* (very small in the fluff), *Goniocotes gigas* (the large chiken louse), *Goniocotes dissimilis* (the brown chicken louse), *Menacanthus cornutus* (the body louse), *Uchida pallidula* or *Oxylipeurus dentatus* (the small body louse). Turkeys may also be infested with *Chelopistes meleagrdis* (the large turkeys louse), *Oxylipeurus polytrapezius* (the slender turkey louse), and *Menacanthus stamineus* (the chicken body louse). Because lice transfer from one bird species to another when the hosts are in close

contact, other domestic and caged birds may be infested with species of *Mallophagia* that are usually host specific. Heavy population of the chicken body louse decrease reproductive potential in males, egg production in females, and weight gain in growing chickens. The skin irritation is also sites for secondary bacterial infections (Kahn, 2005).

The common free-living ectoparasitic mites of poultry belong to the family *Dermanyssidae* and include the chicken mite, northern fowl mite, and tropical fowl mite. They are blood suckers and can run rapidly on the skin and feathers. The chicken mite (*Dermanyssus gallinea*, also called red mite, is found world wide and is particularly serious in warmer parts of the temperate zone in older poultry houses. The mite is rare in modern large commercial caged layer operations, but is seen frequently in modern broiler breeder farms. It can be identified by the shape of the dorsal plate and by the long whip like chelicerae (Calneck, 1997). The chicken mite infests chickens, turkeys, pigeons, and various wild birds. Chicken mite is nocturnal feeders that hide during the day under manure, on roosts, in cracks, and crevices of the chicken house where they deposit eggs. Populations develop rapidly during the warmer months and more slowly in cold weathers (Kahn, 2005).

Northern fowl mite (*Ornithonyssus sylviarum*) is the commonest and most important permanent parasites of poultry in all major poultry production areas of the United States. It also recognized as a serious pest through out the temperate zone of other countries. It is extremely common in almost all types of production facilities. Unlike the chicken mite, the northern fowl mite can easily be found on birds in the day as well as night, since breeds continuously (Calneck, 1997).

Tropical fowl mite (*Ornithonyssus bursa*) is distributed through out the warmer region of the world and possibly replaces the northern fowl mite in these regions. It is a much less important pest in the United States. Hosts include poultry, pigeons, sparrows and humans. The tropical fowl mite closely resembles the northern fowl mite but can be distinguished by the shape of the dorsal plate and pattern of setae. This mite can pass entire life cycle on chickens (Calneck, 1997). Transmission of the chicken mite, as well as the northern fowl mite and tropical fowl mite is by depression or by contact with infested birds, animals or inanimate objects (Kahn, 2005).

The fowl tick, also called soft-bodied tick, inhabiting poultry houses belong to the family *Argasidae*. They do not have scutum (dorsal head), with exception for larvae stage they feed intermittently in all stages. The integument is leathery, wrinkled and granulated in appearance. The capitulum (head) is ventrally placed near the anterior margin of the body. The genus Argas consist of three species: *Arga persicus*, *Arga sanchezi* and *Argas radiates* (Calneck, 1997).

Soft bodied ticks (*Argasidae*) are the most important ticks of poultry. Birds suffer chiefly from attacks of these ticks during the warm dry season. Loss of blood may reach proportion of fatal anemia at the least, there may be emaciation, weakness, slow growth and lowered production. Ruffled feathers, poor appetite, and diarrhea are signs suggesting tick infestations. The fowl tick is capable of transmitting the highly pathogenic spirochetes Borrelia anserine in many parts of the world. Tick-borne avian spirochetosis has been reported in chickens and turkeys in the United States. Fowl ticks have been reported to transmit *Aegyptianella pullorum* and fowl cholera (*Pasteurella multocida*) in some regions of the world (Calneck, 1997).

Therefore, the objectives of this study were:

- ✓ To determine the prevalence of ectoparasites in poultry managed in the backyard production system in the study area.
- ✓ To identify the species of ectoparasites in poultry in the study area.

2. Material and Methods

2.1. Study Area

The study was conducted in Mareka woreda of Dawuro zone in South Nation Nationalities and Peoples Region (SNNPR) of Ethiopia starting from November 2010 to April 2011. According to the information obtained from office of agriculture, the Mareka woreda situated at a distance of 282 km from Awassa and 512 km away from Addis Ababa. Topographically the woreda lies between 6.59 to 7.34^{o}C latitude and 36.68 to 37.52^{o}C longitudes with an elevation ranging 501-2500meters above sea level. The woreda boarded on the north Genabosa, on the east Loma, on the south Esara, on the west Tocha. The mareka wored has bimodal rainfall with the mean annual rainfall of 1200mm and

the mean annual temperature ranges from 16-21°C. The short rainy season starts from February to March where as the long rainy season from May to September.

The main occupation of the population is crop-livestock mixed farming practice and keeps combination of livestock species integrated with a wide range of cereals, pulses, roots, tubers and cash crops grown for house hold consumption and marketing. The major livestock reared in this area are bovine, sheep, goat, donkey and poultry. The numbers of animal population in this area were estimated to constitute, 121,378 cattle, 40,278 goat, 66964 sheep, 3,576 equine and 28,254 poultry (CSA, 2006).

2.2. Study Population

The chickens kept under backyard extensive management system owned by individual farmers were considered as a study population. Chickens were selected by including both sexes, and different age groups were examined for the presence or absence of ectoparasite.

2.3. Study Design

2.3.1. Study Type

A cross sectional study was conducted during collection of data so as to determine the prevalence rate of ectoparasite infestation rate.

2.3.2. Sample Size Determination

The number of poultry required for this study was determined using the formula given by Thrusfield (2005) for simple random sampling.

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

Where,

n= required sample size

P_{exp}= expected prevalence

d= desired absolute precision

The size of sample was determined using 95% level of confidence, 50% expected prevalence since there was no previous work in this study area, and 0.05% desired absolute precision. Therefore, a total of 384 chickens were examined.

2.4. Study Methodology

2.4.1. Clinical Examination

Clinical examination for ectoparasites and any possible abnormalities were carried out taking 384 chickens. During clinical examination ectoparasites were collected by hand picking and preserved in 70% of alcohol in separated bottles for each host for further identification. Both sex and different age groups could also be considered in this study.

2.4.2. Laboratory Examination

The identification of parasites and other relevant activities were done in the parasitology department of Wolayta Soddo regional veterinary laboratory. After collection, the parasites were examined and identified under the microscope by comparing their morphology with identification keys.

2.5. Data Managements and Analysis

The result obtained from collection and identification of ectoparasites from poultry was coded and then entered into Microsoft Excel spread sheet and was analyzed using STATA version 11.0. The prevalence of ectoparasites in relation to age, and sex were analyzed using chi square. In all cases P<0.005 was considered as statistically significant.

3. RESULTS

A total of 384 chickens belonging to different age groups and sexes which are managed under backyard system were examined for ectoparasites infestation. Of these 322/384 (83.85%) chickens were infested with one or more species of ectoparasites that were mainly grouped into fleas 269/384 (83.54%), lice 109/384 (33.85%) and fowl tick 16/384(4.97%). There was also mixed and single infestation accounted for 64/322 (19.87%) and 258/322 (80.12%) respectively (Figure1).

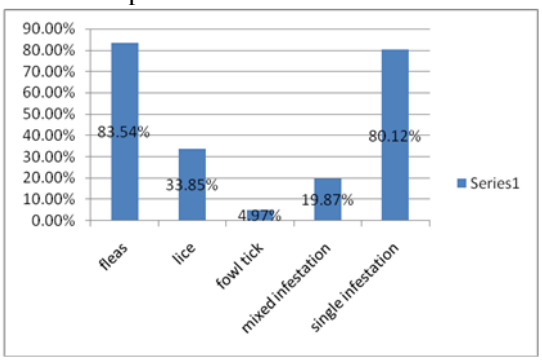

Figure1. *Prevalence distribution of different poultry ectoparasites infestation*

Five species of lice (order Mallophaga), one species of fleas (order Siphonaptera) and one species of tick (order Acari) were detected from 384 examined chickens in this study. The lice include *Menophon gallinae* 49/109 (44.95%), *Menacanthus stramineus* 22/109 (20.18%), *Lipeurus caponis* 17/109 (15.6%), *Goniocotes gigas* 14/109 (12.8%) and *Goniocotes gallinea* 7/109 (6.4%). The fleas were *Echidnophaga gallinacean* and the tick was *Argas persicus*. Over all prevalence of ectoparasites of infestation was 83.85%. Over all, fleas had the highest frequency of occurrence with an 83.5% prevalence followed by the lice with the prevalence of 33.85% and the lowest was fowl tick with the prevalence of 4.96%. Seven species of ectoparasites were identified to be common and their respective infestation prevalence and attachment sites are given in Table1.

Table1. *Ectoparasites and their attachment sites in free range chickens*

Ectoparasites group	Species	Attachment sites	Numbers of infested	Infestation rate (%)
Fleas	*Echidnophaga gallinacaen*	Head, eyes, Comb, wattles	269	83.5
Lice	*Menopon gallinea*	Breast, thigh	49	44.95
	Menacanthus Stramineus	All over the body	22	20.18
	Lipeurus caponis	Head, feather	17	15.59
	Goniocotes gigas	Feather	14	12.84
	Goniocotes gallinea	Base of feather	7	6.422
Tick	*Argus persicus*	under the wing base	16	4.97

Infestation rate of ectoparasites were compared among different age groups. It was found that brooders poultry had significantly high ($P<0.05$) (Table2) infestation rate (44.41%) compare to the adult age group (13.66%).

Table2. *Prevalence association of ectoparasites with age*

Variable		No. of examined	No. of positive	Prevalence (%)
	Brooder	152	143	44.41
Age	young	155	135	41.92
	Adult	77	44	13.66
Total		384	322	

X^2 (Pearson Chi-square) = 53.52, P-value = 0.000

There was significant difference in the infestation rate of ectoparasite between two sexes, where, ($P<0.05$) (Table3).

Table3. *Prevalence association of ectoparasites with sexes*

Variable		No. of examined	No. of positive	Prevalence (%)
Sex	Female	233	209	64.90
	Male	151	113	35.09
Total		384	322	

X^2 (Pearson Chi-square) = 14.95, P-value = 0.000

4. DISCUSSION

In the present study, total prevalence of ectoparasites (83.85%) was recorded in the chickens managed under backyard system. This finding is higher than the previous study conducted by Al-Saffar and Al-Mawla (2008), Nnadi and George (2009), Koroglu *et al*. (1999) and Barsabeh (1999), 19.3%, 41%, 56.5% and 78.0%, respectively. This difference in prevalence rate could be due to climatic condition, age of study animals and sample size. Besides, the village poultry are mostly neglected and reared only a little or no extra feed supplement and improper housing that makes them malnourished. The keeping condition is also very unhygienic, often crowded in a small place with little or no ventilation. All these factors either alone or in combination might have important role in the high prevalence of ectoparasites in backyard poultry (Shanta *et al.*, 2006).

The *Echidnophaga gallinacean* (stick tight flea) has the highest prevalence when compared to other ectoparasites found in this study. Out of

322 positive chickens, 269 (83.5%) was *Echidnophaga gallinacean*. The prevalence of *Echidnophaga gallinacean* in the present study is high when compared to the other studies carried by Solomon and Elsabet (2009) (16.5%) in Wolayta Soddo town in southern Ethiopia, Nnadi and George (2009) (35.7%) in south-eastern Nigeria and Gedion (1991) (14.6%) in and around Dire Dawa. The high prevalence (71.9%) of *Echidnophaga gallinacean* reported by Swai *et al*. (2009) in northern Tanzania was more or less similar to the present study.

In the present study 33.85% prevalence of lice infestation was recorded. This is more or less similar to the previous study carried out in Northern Tanzania by Swai *et al*., (2009) reported 28.5% of prevalence of lice infestation. In Contrast to this, lowest prevalence (12.5%) of lice infestation was recorded by Al-Saffar and Al-Mawla (2008). The current study is by far lower than different studies conducted in different parts of the world. Saxena *et al*., (2004) reported 60.9% lice infestation of fowls in India and Koroglu *et al*., (1999) 56.5% infestation with one or more species of lice in Turkey. Among the lice species, the most common found in this study was, *Menopon gallinae* 49 (44.95%). When comparing the prevalence of *Menopon gallinae* in this study (44.95%) was more or less similar to the previous studies carried by Solomon and Elsabet (2009) and Shanta *et al*., (2006) 48.94%, 63% respectively.

The lowest prevalence recorded among the ectoparasites in this study was the fowl tick (*Argas persicus*) which was 16 (4.97%). This was more or less similar when compared with 6.8% recorded by Al-Saffar and Al-Mawla (2008) in Mosul, Iraq and also 9.2% recorded by Solomon and Elsabet (2009) in Wolaita Soddo town in southern Ethiopia. On contrast to this study, Swai *et al*. (2009) and Kha *et al*. (2001) were recorded 23.9% and 14.7% prevalence of *Argas persicus* respectively.

In the present study there was a significant difference ($P<0.005$) in prevalence rate of ectoparasites infestation with age. It was found that brooders poultry had high infestation rate than adult age group. This is related to the recent study in southern Ethiopia in Wolaita Soddo town by Solomon and Elsabet (2009) and in south-eastern Nigeria by Nnadi and George (2009), reported that the young age group were more likely to be infested than adults. There were study that in extensive management system, where chickens have access to outdoor areas and not confined, do have a greater diversity of ectoparasites (Abebe *et al*., 1997). This finding was contrary to the study done by Shanta *et al.* (2006) in Bangladesh, who reported that adults were found to be more infested. This variation could be due to climatic condition, agro-ecological zone, study period and management system.

There was significant difference ($P<0.05$) in infestation rate of ectoparasite between the two sexes. This study was similar to other study done in northern Tanzania by Swai *et al*., (2009). On contrary to the present study, Hellina (2000) reported that there was no significant difference in the prevalence rate of ectoparasite infestation between the two sexes. This difference could be due to climatic condition, age, opportunity of exposure of chickens to the ectoparasites, management system and sample size (Shanta *et al*., 2006).

5. Conclusion and Recommendations

Backyard poultry production has been a major source of poultry meat and egg production in Ethiopia and yet is still the most neglected in husbandry practices and particular health care. Generally, the study indicated that the external parasites are highly prevalent in poultry in the backyard management system, which is associated with lack of due attention with respect to hygienic system, treatment and control practices. Among those external parasites, *Echidnophaga gallinacean* was the most prevalent ectoparasites followed by lice species including; *Menopon gallinae*, *Menacanthus stramineus*, *Lipeurus caponis*, *Goniocotes gigas* and *Goniocotes gallinea* and the soft tick called *Argas persicus*. In the study area there was no any modern animal health care for these back yard kept poultry that might have attributed for higher distribution of ectoparastes. Therefore, the following points are taken as recommendations:

- ✓ Awareness should be created to the community on the overall effect of ectoparasites on productivity of poultry.
- ✓ Farmers and extension staff should be trained regarding on improved housing, feeding, disease control and improved productivity of local chicken.
- ✓ Further investigation should be carried to identify and estimate external parasites and their effect on the productivity and health of the poultry.

- ✓ The government should take responsibility to provide the control measure to the farmers.

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ANNEXES

Annexes1. List of materials used during sample collection and identification of ectoparasites

- ✓ 70% alcohol
- ✓ Glass slide
- ✓ Ice box for transportation
- ✓ Labeling tape
- ✓ Pencil
- ✓ Petridish
- ✓ Sample recording format
- ✓ Sampling bottle for each host
- ✓ Smooth thumb forceps
- ✓ Microscope

Annex2. Sample collection format

No.	Age of poultry	Sex of poultry	Ecto. Pos./neg.	Sites of attachment on the body of poultry								
				Breast	Comb	Eye	feather	Head	thigh	wattle	wing	E. P. body
1												
2												
3												
4												
5												

E. P. body. Every parts of the body

Ect. Pos. /neg. Ectoparasites positive or negative

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