

Prevalence of External parasite of poultry in intensive and backyard chicken farm at Wolayta Soddo town, Southern Ethiopia

*Solomon Mekuria and Elsabet Gezahegn

Hawassa University, Faculty of Veterinary Medicine P.O.box 05 Hawassa, Ethiopia

* corresponding author e-mail: solmk2000@yahoo.com

Abstract

A cross sectional study was conducted from Nov. 2008 to April 2009 to identify and estimate prevalence of ectoparasites of poultry in intensive and backyard chicken farm at Wolayta Soddo town southern nation nationalities and peoples region of Ethiopia. Three hundred eighty four chickens were selected using systematic random sampling technique. Ectoparasites were collected from different parts of the body including skin scraping from shank. Concomitantly age, sex as well as other risk factors recorded. The study result showed that four genus (lice, flea, mite and tick) and six species of ectoparasites recovered in back yard and none in intensive production system. The prevalence of external parasite infestation in backyard production system were 88% lice, 16.5% flea, 8.1% mite and 9.2% tick. *Menopon gallinae* 49 (139/284) the most prevalent ectoparasite species followed by *Cuclotogaster heterographus* 40%(115/284) while *Cnemidocoptes mutans* 8.1%(23/284) was the least identified. The finding in age group showed that there was a significant difference in prevalence of lice infestation between young and adult chicken ($P < 0.05$) with odds ratio of 5.2. Where young age group are 5.2 times more likely to be infested with lice than adult ones, where as mite prevalence was significantly different between age group with OR of 2.8, where adult group are 2.8 times more likely to be infested than young. On the other hand, flea and tick weren't significantly different ($P > 0.05$) in both age and sex groups but it needs further study to find plausible explanation. The study indicated that external parasites are highly prevalent in backyard chicken, which is associated with poor hygienic system. There is a need to improve hygiene to increase chicken productivity in the area.

Key words: Chicken, Ectoparasites, Prevalence, Backyard, Intensive, Commercial Poultry Farm, Wolayta Soddo, Hygiene.

Introduction

Indigenous breed of chicken are raised under backyard conditions and very few exotic breed of chicken are kept under intensive production system. It is estimated that 56.5 million of chicken exists in Ethiopia, among these 99% and 1% accounts traditional or backyard and intensive production system, respectively (CSA, 2005). Most of the time rural women and children mostly own the village chicken husbandry. Each household possess in the range of 4-15 chicken. Most of them used for home consumption and the remaining products are supplied to the local markets. Rural women use chickens as an immediate cash source for their urgent needs. Children, boys and girls equally, rely on the sale of chicken to pay their school fees and to buy school materials (Mebratu and Marta, 1997).

Raising poultry has a long tradition in Ethiopia

and the production system shows a clear relation between the traditional subsistence, low input system for small-scale production system, compared with large-scale commercial systems, which use relatively advanced technology (Alemu Sida, 1985). The backyard (traditional) production system is characterized by minimum inputs given by the owners, usually kept small in number and left over to the surrounding village in order to scavenge feed from the ground except that occasionally supplemented by grain feeds and household by-products. They breed naturally, receive no specific housing and the standard of housing varies greatly from one household to the other. In most areas, the chickens share the same house with their owners at night (Hagos and Eshetu, 2005 and personal observation).

The main constraints to the development of indigenous chicken production in rural Ethiopia include

disease, predation, and lack of feed, housing, poor management and to lesser extent financial problems (Edward, 1992). Different poultry diseases have been recorded in Ethiopia. The major causes of economic loss include Newcastle disease (ND), coccidiosis, salmonellosis, chronic respiratory disease (CRD) and nutritional deficiencies (Alamargot et al., 1985).

In addition, Abebe Wosene et al., (1997) reported different ecto-parasite prevalence in different management systems. The highest prevalence was reported in the free-range chickens. In the cage system, the only ectoparasite found was the mite *Dermanyssus gallinae*, where as in semi-intensive system lice species of *G. gigas* had prevalence of 44.1%, *M. gallinae* 23.5%, *M. stramineus* 10.7%, *G. gallinae* 2.1% and *D. gallinae* 0.92%. In the free-ranging chickens, *G. gigas* 78.9%, *M. gallinae* 60.5%, *M. stramineus* 26.6%, *G. gallinae* 10% and *C. heterographus* 14.7% were prevalent. On the other hand, Hagos and Eshetu (2005) reported ectoparasites of poultry from central Ethiopia had the prevalence of 93.7% (n=190) diverse species of ectoparasites were recovered. Among these *M. gallinae* 87.9%, *M. stramineus* (71.6%), *Knemidocoptes mutans* (19.5%) and others were recorded.

Parasites, both internal and external, are common in the tropics where the standard of husbandry is poor, yet climatic conditions are favorable for the development of the parasites. Even though, ectoparasites diseases are among the major causes that decrease productivity of chickens, they are often neglected in traditional management system (Abebe Wosene et al., 1997; Hagos and Eshetu, 2005). This study attempts to provide information about the prevalence of ectoparasites in Wolayta Soddo town in both intensive and extensive production system.

Material and Methods

Study area description

The study was conducted in Wolayta Soddo Town in Southern Nation, Nationalities and Peoples Regional State of Ethiopia from Nov. 2008 to April 2009. The study area is located in southwest direction at 210, which are 390kms far from Addis Ababa and 165kms far from Hawassa town. The Wolayta Soddo town lies between the altitude range of 2000-2500 meters above sea level and annual average rainfall ranges from 450mm -1446 mm. The mean annual maximum and minimum temperature are 26.60C and 11.40C, respectively. The predominant farming system is mixed livestock and crop production system (WZRD, 2003).

Study Animals

The target population includes chicken of all age, both sex groups found in Soddo town, and selected groups were used as study population from which

samples were randomly selected to be examined for the presence or absence of ecto-parasites.

Study design

A cross-sectional type of study design was used in which samples were taken as "snapshot" from selected intensive and backyard farm in Soddo town.

Sample Size

The sample size was determined based on the formula given by (Thrusfield, 1995) for simple random sampling methods; 50% expected prevalence and 5% absolute precision was applied. Accordingly, around 384 chickens were selected for this study. The sample size allocated proportionally to the backyard and intensive farm.

Sampling procedure

A total sample size of 384 was allocated to both intensive and backyard farm based on fixed allocation. Accordingly, 100 and 284 chickens were allocated proportionally and systematically selected from 3,000 and 12,000 chickens in intensive and backyard production system, respectively. Systematic sampling methods were applied after sampling interval was determined using the formula $K=N/n$. Where: N = represents estimated total chickens for backyard farm and intensive farm in sampling frames; n = represents allocated sample size for respective management system and K = interval of chicken or household to be sampled in intensive and backyard farm, respectively (Pfeiffer, 2002). Accordingly, at every 30 chicken and 42 household intervals a chick was caught and examined.

Parasitological Examination

After the clinical examination of all chicken, external parasite collected from different parts of the body around the wing, head, vent, feather, feet, leg, wattle, comb and eyes recorded. The legs and featureless areas with crest were scrapped. Samples taken to Soddo regional laboratory for parasitological identification based on the morphological features described by Soulsby (1982).

Data analysis

Data entered into Excel spreadsheet and analyzed using Stata-9. Types of external parasites recovered and their prevalence in different management system were analyzed. Statistically significant differences were considered when $P < 0.05$.

Results

External parasites

In this preliminary survey of external parasite of poultry in the study area diverse species recovered from backyard or free range production system, whereas external parasites was not possible to recover in intensive farm. Species of external parasites recovered in backyard chicken includes lice, flea's, mites and tick. Five species of biting lice (order: Mallophaga), one species of fleas (order:

Table-1. Species of lice identified and their prevalence out of the total chicken sampled in back yard (free ranging) production management system Wolayta Soddo 2008/09

Spp	Predilection Site	n	No of positive	Prevalence (%)	95% CI
<i>Cuclotogaster heterographus</i>	Comb, wattle	284	115	40	[34 -46]
<i>Menopon gallinae</i>	Shaft	284	139	49	[43 -55]
<i>Gonoicotes gallinae</i>	Fluffy feather	284	93	33	[28 -38]
<i>Gonoides gigas</i>	Body and feathered	284	30	11	[8 - 14]
<i>Menacanthus stramineus</i>	Near cloaca, thigh and breast region	284	57	20	[16 -24]

Siphonaptera), one species of mite (*Cnemidocoptes mutans*) and one species of tick (genus: *Rhipicephalus*) were found in this study. The lice species that was identified were *Menacanthus stramineus* (body louse in less feathered area), *Menopon gallinae* (shaft louse), *Gonoides gigas* (large louse of the body and feather), *Gonoicotes gallinae* (fluff louse) and *Cuclotogaster heterographus* (head louse). The flea was *Echidnophaga gallinacean*.

Prevalence

The overall ectoparasite prevalence shown in figure-1 indicates that lice receive the highest percentage (65.1%), and followed by fleas (12.8%), tick (6.8%) and mite (5.9%) with significant difference ($P < 0.001$), where as prevalence in backyard accounts 88% lice, 16.5% flea, 8.1% mite and 9.2% tick. As shown in table 2 among the lice species observed *Menopon gallinae* had the highest prevalent (49%) and followed by *Cuclotogaster heterographus* (40%) and *Gonoicotes gallinae* (33%). There were significantly ($P < 0.001$) higher prevalence of *Menopon gallinae*, *Cuclotogaster heterographus* and *Gonoicotes gallinae*.

Prevalence of ectoparasites for the assumed factor

External parasite species that were recovered during study were analyzed against the assumed factors, age group and sex; since the type of management and types of breed kept were the same in backyard production system. As shown in table 3 lice infestation in younger age group was 95.7% and in older age group was 80%, which showed significant difference ($P < 0.001$) with Odds ratio (OR) of 5.2; where age group less than 6 months were 5.2 time more likely infested than age group above 6 months of age. On the other hand mite prevalence was 4.3% and 11.6% in young and adult group, respectively, with significant

difference ($P < 0.05$). However, ectoparasites prevalence has no significant difference in both sex ($P > 0.05$) as shown in table 4. Further analysis was made to estimate species of lice infestation has statistical association with age and sex groups, and therefore *Menopon gallinae* species had shown significant difference ($P < 0.05$) in both age and sex group as shown in table 4 and 5.

Housing and cleaning activities

In intensive chicken farm to minimize external parasite problem, they were cleaning the premises regularly between batches of chicken, during all-out and all-in flock replacement. There was smooth wall house contraction with mesh, to keep away from wild birds and to maintain ventilation. The chickens were kept based on age groups such as brood, pullet and parent stock. The houses fumigated and cleaned for a week before the new batch entered. This practice holds true at regular basis every time between the period of all-out and all-in program.

In backyard chicken production system, the chicken were sharing the same house with their owners as well as with other animals. The home was made of grass-thatched, mud and local wood, where there were cracks and craves in the house which allows the external parasites to hide them and multiply. All age group of chicken kept together. Cleaning of chicken litter were not frequent in many of the house hold in the study area. There was high chance of contact between infested and cleaned ones, while feeding around the house.

Discussion

The present study revealed that the existence and occurrence of various ecto-parasite in backyard farm and none in intensive farm. The finding is

Table-2. Prevalence of ectoparasites recovered in backyard production system compared with age groups in Wolayta Soddo town, SNNPRs in 2008 /09

Ectoparasites	Age group	Sample size	No of positive	Prevalence(%)	95%CI	P-value	OR
Lice	< 6 months	138	132	95.7	92 - 99	0.00	15.2
	> 6 months	146	118	80.8	73 - 86		
Flea	< 6 months	138	25	18.1	12 - 25	0.49	01.2
	> 6 months	146	22	15.1	9 - 21		
Mite	< 6 months	138	6	4.3	1 - 7	0.03	2.8
	> 6 months	146	17	11.6	6 - 17		
Tick	< 6 months	138	9	6.5	2 - 12	0.14	00.53
	> 6 months	146	17	11.6	6 - 17		

Table 3: Prevalence of ectoparasite between sex group in backyard production system in Wolayta Soddo town in 2008 /09

Ectoparasite	Sex group	Sample size	No of positive	Prevalence	95%CI	P-value	OR
Lice	Female	141	127	90.1	85 - 95	0.294	1.47
	Male	143	123	85	80 - 92		
Flea	Female	141	27	19.1	13 - 26	0.243	1.45
	Male	143	20	13.9	8.2 - 19.6		
Mite	Female	141	15	10.6	5.0 - 16.0	0.125	2.00
	Male	143	8	5.6	1.8 - 9.3		
Tick	Female	141	13	9.2	4.0 - 14.0	0.970	1.01
	Male	143	13	9.1	4.0 - 13.0		

comparable to the study conducted in Malawi, where there was diverse ecto-parasites in back yard and none in commercial poultry farm as reported by Njunga G.R., (2003). Hagos and Eshetu (2005) have reported different species of ectoparsites in backyard chicken production system of central Ethiopia.

The over all ectoparasite prevalence indicates that lice received the highest percentage (65.1%), and followed by fleas (12.8%), tick (6.8%) and mite (5.9%) with significant difference ($P < 0.001$). Among the lice species observed, *Menopon gallinae* had the highest prevalence (49%) in backyard farm. *Culclotogaster heterographus* (40%) was the second most prevalent species of lice encountered.

Similar finding has reported by Hagos and Eshetu (2005) where higher prevalence of *Menopon gallinae* (87.9%) and the least was *Culclotogaster heterographus* were recorded in central Ethiopia. *Culclotogaster heterographus* it does not suck blood, the head louse is very irritating and ranks first among lice as a pest of young chickens (Ronald, 1914). In this study shown that young age groups was significantly affected ($P < 0.05$) than adult. Scaly leg mite, *Knemidocoptes mutans* in this study was 5.9% prevalent; and is a small spherical sarcoptic mite usually tunnels in to the tissue under the scales causing an inflammation with exudates that hardens on the surface and displace the scales resulting in marked keratinization which is responsible for the thickened scaly nature of the feet (Urquart et al, 1987). Hagos and Eshetu (2005) reported 19.5% prevalence of *Knemidocoptes mutans*. Low prevalence in this study may be due to highland, cold temperature and/or individual health management

system. Study finding has indicated that hot agro ecological zone, lowland and midland, found to be suitable for ectoparasites of chicken (Hagos and Eshetu 2005, Gedion, 1991, Fabiyi, 1988). At higher altitudes, colder temperatures of the highland areas inhibit the development and survival of the early stages of ectoparasites. However, the warmer temperature of mid and lowland areas provides favorable conditions for the survival, propagation and life cycle progression of the diverse parasite fauna. The stick tight fleas, *Echidophaga gallinacea* (12.8%), are the smallest type of flea. They are a borrowing and stationary flea as compared to most flea, which are jumping fleas (Pickwroth, 2003). Tick of (*Rhipicephalus speices*) with prevalence of 9.2% recovered.

The high prevalence of ectoparasite in backyard may be attributed to low input management system as well as suitable environmental factors favoring the propagation and life cycle progression of the diverse ectoparasite species in studied area and none ectoparasite prevalence in the intensive farm is associated with good management system of the farm. In intensive farm, they clean the houses between batches of the chicken, there is whole flock replacement rather than partial culling and replacement, cemented house construction and mesh to keep away from wild birds has great advantage to sanitize the promises. Fumigation of the house before the chicken entered plays an important role in controlling ectoparasites. The study has indicated that high prevalence of ecto parasite in backyard chicken and none in intensive system is directly associated with hygienic management system. Mungube et.al., (2008)

Table-4. Prevalence of lice between sex groups in backyard chicken

Species of lice	Sex	Sample size	Prevalence (%)	P - value	OR	(CI)
<i>C. heterogrphus</i>	Female	141	39.00	0.61	0.88	(0.55, 1.4)
	Male	143	41.95			
<i>M. gallinae</i>	Female	141	55.31	0.003	2.03	(1.26,3.26)
	Male	143	42.65			
<i>G. gallinae</i>	Female	141	30.49	0.47	1.19	(0.73,1.96)
	Male	143	34.96			
<i>G. gigas</i>	Female	141	12.05	0.42	1.37	(0.64,2.94)
	Male	143	9.09			
<i>M. stramineus</i>	Female	141	19.85	0.93	0.97	(0.54,1.74)
	Male	143	20.02			

Table-5. Prevalence of lice between age group in backyard chicken

Spp of lice	Age	Sample size	Prevalence	P – value	OR[CI]
<i>C. heterogrphus</i>	< 6 months	138	45.6	0.08	1.51(0.94,2.44)
	> 6 months	146	35.6		
<i>M. gallinae</i>	< 6 months	138	57.9	0.003	1.66(1.04,2.66)
	> 6months	146	40.4		
<i>G. gallinae</i>	<6months	138	34.8	0.42	0.82(0.49,1.34)
	>6months	146	30.8		
<i>G. gigas</i>	<6months	138	7.9	0.42	1.37(0.64,2.94)
	>6months	146	13.0		
<i>M. stramineus</i>	<6months	138	23.39	0.93	0.97(0.54,1.74)
	>6months	146	16.43		

has shown that the occurrence of ectoparasites were associated with poor hygiene in the farm/chicken house and the absence of parasite control practices. It was further explained that high frequency become a major constraint to productivity of chickens. Human and chicken housing units made of grass thatched roofs and mud walls reported higher cases of fleas as compared to those with cemented walls and iron roofs. Ectoparasite interaction finding as shown in table 6 supports Mungube et al., (2008) findings where there was a significant interaction noted amongst the various classes of ectoparasites. The explanation for this is that they occur in environments with poor hygiene and where insecticides and/or acaricides rarely used to control the parasites.

Lice infestation in age group showed significant difference ($p < 0.001$) with odds ratio (OR) of 5.2; where age group less than 6 month were 5.2 times more likely infested than age group above 6 months of age. The likely explanation is unclear and it needs further research.

On the other hand, mites infestation showed significant ($p < 0.05$) association with age group with Odds ratio(OR)of 2.8 , where age groups > 6 months are 2.8 times more likely infested than age group < 6months. This might be associated with long period exposure.

The prevalence of flea, mite and tick were analyzed against the assumed risk factors age and sex, there was no statistically significant difference ($P > 0.05$). This may be attributed to similar management system in both age groups and the environmental stress factors such as over crowding, deprivation of food, water and extremes temperature depress the immune system that may not lead difference in both age groups. Sex, as variable had shown no significant difference in the prevalence of ectoparasites mentioned above. This might be due to similar management system in both sex, moreover, it might also be that ectoparasite infestation is not directly related to animal reproductive system. However, the *Menopon gallinae* species had shown significant difference ($p < 0.05$) in sex. This might be by chance, other wise there is no direct relation with sex groups.

This study has shown that external parasites are highly prevalent on backyard managed local chickens in the study area.

Conclusion and Recommendation

This study showed that backyard chicken had diverse external parasite infestation, which is known to adversely affect their health status and contribute to decreased productivity. In the intensive production system, there was no ecto-parasite recovered. This clearly shows that good management has significant positive impact in controlling ectoparasite in poultry production. Therefore, application of parasite control measures must thus takes priority attention in conjunction with good hygienic practices including separate based on age groups, construct houses having no cracks and crevices is paramount important.

References

1. Abebe, W., Asfaw, T., Genete, B., Kassa, B., Dorchie, P.H., (1997). Comparative Studies of external parasites and gastrointestinal helminthes of chickens kept under different management system in and around Addis Ababa (Ethiopia) *Rev. Med. Vet* 148(6) 497-500.
2. Alamargot J., Mengistu, A., and Fesseha, G., (1985). A survey of Ectoparasites and GI helminthes of Backyard chickens in three selected agro climatic Zones in central Ethiopia. P 61.
3. Alemu Sida (1995). The Status of poultry research and development in Ethiopia. In IAR proceedings (ed); the status of livestock, pasture and forage research and developments in Ethiopia. *Agricultural research Institute*, PP 62-70.
4. Edward, H., (1992). Small scale poultry keeping in wolaita, North Omo region, Farmer's research project (FRP). Technical pamphlet, No. 3. Farm Africa, Addis Ababa Ethiopia, 3.
5. Fabyi J.P., (1988). Incidence of the helminth parasites of the domestic fowl in the Vom area of Benue Plateau State-Nigeria. *Bulletin for epizootiological diseases in Africa* 20: 229-234.
6. Gedion Yilma, (1991). A preliminary survey of ectoparasites and GI helminthes of local chickens in and around DireDawa DVM Thesis, Faculty of Veterinary Medicine Addis Ababa University, *Debrezeit Ethiopia* P 38.
7. Hagos.A and Eshetu, Y., (2005). Ectoparasites of local

- scavenging chickens of Central Ethiopia SINET, *Ethiopia Journal of Science*. 28 (1) 69-74.
8. Mebratu , G.Y, and Martha , Y., (1997). The use of feed based Thermotolerant V4strain vaccine to control Newcastle disease in village chickens. National Veterinary Institution, *Debre Zeit Ethiopia*. Vol.1, pp. 1..
 9. Mungube, O.E., Bauni, S.M., Tenhagen B.A., Wamae, L.W., Nzioka S.M., Muhammed, L., and Nginyi , J.M., (2008). Prevalence of parasites of the local scavenging chickens in a selected semi-arid zone of eastern Kenya. *Tropical animal health production*. 40: 101-109.
 10. Njunga, R.G., (2003). Ecto-and haemoparasites of chicken in Malawi With emphasis on the effects of the chicken louse, *Menacanthus cornutus*. [www.poultry.life.ku.dk/information/resources/References/-/Media/migration%20Folder/upload/Poultry/masterthesis/njunga.Stata Corp., 2001. Stata statistical software. Release 9.0 lake way drive, college station, Texas](http://www.poultry.life.ku.dk/information/resources/References/-/Media/migration%20Folder/upload/Poultry/masterthesis/njunga.StataCorp.,2001.Statastatisticalsoftware.Release9.0lakewaydrive,collegestation,Texas).
 11. Soulsby, E.J.L.,(1982). Helminths, arthropods and protozoa of Domesticated Animals, 7th edit. Baillere Tindall East Sussex, UK.
 12. Thrusfield, (1995). Sampling. In: *Veterinary epidemiology second edition* university of Udiuburgh Black well, science. Pp, 180-188.
 13. Pfeiffer, D.V., (2002). An introduction to veterinary epidemiology. The Royal Veterinary College. University of London UK. PP 1-61.
 14. Pick Worth, L.T., (2003). Less Common external parasite in poultry. Ohio State university extension Fact sheet available at file: //k:/Less% 20 common % 20 External%20parasite20poultry,%20VME-009 accessed 10/17/2008.
 15. Ronald, A., (1994). External parasites of poultry in missipi state University extension service available at file://k:/is 331 accessed 10/17/2000, page 1-3.
 16. Urquhart, G.M, et.al.(1996). *veterinary parasitology 2nd*, Newyork: Black well science .

* * * * *