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Review Article

Review on Importance of Ectoparasites in Backyard Chicken Production Systems in Rural Ethiopia

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Abstract
Backyard chicken production plays a significant role in rural Ethiopia, contributing to food security and household income. However, indigenous chickens reared under traditional scavenging systems face numerous challenges, with ectoparasite infestations being a major constraint. These ectoparasites, including fleas, lice, ticks, and mites, lead to health issues, reduced productivity, and economic losses. Despite their impact, ectoparasites in Ethiopian backyard poultry systems remain understudied. This review aims to estimate the prevalence of ectoparasites in backyard chicken production and identify the major species affecting poultry in rural Ethiopia. We examine the status of the village chicken production system, explore the challenges faced by poultry farmers, and highlight the role of ectoparasites in reducing productivity. Key ectoparasites such as *Echidnophaga gallinacea* (flea), *Menacanthus stramineus* (louse), *Argas persicus* (tick), and *Dermanyssus gallinae* (mite) are discussed in terms of their epidemiology, economic impact, and control methods. The findings underscore the need for targeted interventions to control ectoparasite infestations, improve poultry health, and enhance production systems in rural Ethiopia.
Keywords: Backyard chickens, Control measures, Ectoparasites, Parasite species

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Introduction

Animal and chicken production in particular play important socioeconomic roles in developing countries. Providing animal protein, generating extra cash incomes, and religious/cultural considerations are the major reasons for keeping village chickens in rural communities. Various scholars and rural development agencies have recognized the role of indigenous poultry production in improving the nutritional status and income of many small farmers and landowners (landless workers) (1).

Poultry can be found everywhere around the globe and lives side by side with humans as a source of food, a hobby, and for experimental purposes. They also play a vital role in narrowing down the animal protein supply gap in a short period (2). The Central Statistical Agency/ CSA (3) estimates Ethiopia's total poultry population at about 57 million, out of the world's total population of 18 billion. backyard management system, with inadequate housing, feeding, and health care (4). Traditional poultry production is often described as a low input/low output system. The low productivity is mainly caused by diseases, suboptimal management, and a lack of supplementary feed. It is an integral part of balanced farm management and lacks a unique position in the rural household 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 households, rural poultry integrates very well and sustainably into other farming activities because they require little in the way of labor and initial investment activities. In Ethiopia, chickens are the most widespread, and very rural families own chickens, providing a valuable source of widespread protein and income (5).

Indigenous chickens reared under the traditional scavenging system play a significant role through their contribution to the cultural and social lives of rural people (6). Among the animal production activities, the poultry sector is the fastest growing. Nevertheless, indigenous chicken production in rural Ethiopia has been challenged with several constraints, among others, disease, predation, lack of feed, housing, and poor management (7). Among the constraints, parasitism ranks top in village chicken production. Parasitism due to gastrointestinal helminths and ectoparasites constitutes among the major causes that decrease the productivity of chickens but is neglected as they are rarely lethal (8). The prevalence of most parasitic diseases in poultry seems to have been reduced in commercial poultry production due to improvements in management systems, although in rural scavenging poultry, many parasites are widely distributed (9).

Like other animals, poultry too suffer from a wide range of maladies and ectoparasite infestation. Ectoparasites are regarded as a basic cause of retardation in growth, lowered vitality, and poor condition of birds. Several types of

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arthropods constitute the major ectoparasites of poultry, primarily lice, fleas, mites, and ticks. External parasites of poultry are very common in the tropical environment of the world since this climatic condition creates a favorable environment for the development of the parasites. Poor standards of poultry husbandry are also contributing factors to the abundance of parasites (10,11).

In most rural areas, the high prevalence of external parasite infestations in backyard chickens poses a great challenge in the poultry industry since the majority of external parasites are associated with poor hygiene of chicken houses and a lack of appropriate parasite control measures (12,13). The degree and types of infestation were influenced by the production method. They live on or in the skin and feathers. They had been characterized by the possession of externally segmented bodies, jointed appendages, and chitinous exoskeletons. It can cause damage to the chickens either directly or indirectly by causing tissue damage, blood loss, irritation, discomfort, toxicosis, allergies, and dermatitis, which in turn reduce the quality and quantity of meat and egg production and may lead to death. It also acts as a vector for several pathogens, such as Pasteurella, Fowl Pox, Newcastle disease virus, and possibly chlamydia. During periods of heavy infestation, external parasites may weaken and decrease the resistance of chickens to a variety of diseases which may lead to death (14).

Ectoparasites significantly affect poultry health, disrupting physiological functions and reducing feed efficiency. They cause persistent irritation, leading to weight loss, emaciation, anemia, and lower production levels for eggs and meat. For instance, ectoparasites can reduce a bird's weight by approximately 711 grams and decrease egg production by about 66 eggs annually, according to Iposu et al (15). However, despite their harmful effects, ectoparasites have received limited attention across various production systems. There is a lack of comparative studies on their distribution, burden, and economic impact on Ethiopian poultry husbandry. Moreover, information is scarce regarding the prevalence and species diversity of poultry ectoparasites in the country particularly within the area covered by this study. This highlights a critical need for targeted research to understand and manage ectoparasite-related challenges in rural poultry systems.

Therefore, the objectives of this review were to investigate the prevalence and impact of ectoparasites in backyard chicken production systems in rural ethiopia.

Literature Review

Status of Backyard/Village Chicken Production System

Poultry keeping practiced by rural households using family labor is referred to as village poultry keeping. This practice is also called rural poultry or rural family poultry (16). The village chicken production system of Ethiopia is mostly an indigenous integral part of the farming system and comprises the indigenous ecotypes of chickens characterized by a short life cycle, quick turnover, small flock size, needing no or fewer inputs, and relatively good output levels and accessible at both inter- and intra-household levels, and periodic devastation of the flock by disease and reared in the extensive (scavenging) production systems. There is no separate poultry house, and the chickens live in family dwellings together with human beings. There is no purposeful feeding of chickens, and scavenging is almost the only source of diet. There is no designed selection and controlled breeding. It is by natural incubation and brooding that chicks are hatched and raised all over rural Ethiopia (17,18).

Challenges and Opportunities of Backyard/Village Chicken Production in Ethiopia

In village chicken production systems, significant challenges to backyard poultry production include high disease prevalence, predation, limited access to health care, inadequate nutrition, and insufficient market information (19,20). Poultry diseases can arise from various factors, such as pathogens, nutritional deficits, ingestion of toxins, physical injury, and both internal and external parasitic infestations. Infectious diseases specifically stem from microorganisms, including parasites, fungi, protozoa, bacteria, mycoplasmas, chlamydia, and viruses (21).

The major diseases of chicken in Oromia regional state were external parasitic infestations, Avian influenza, Newcastle disease, coccidiosis, and salmonella, with the most and least important chicken diseases (22). The greatest health constraint to chicken production in the country is Newcastle disease (23). The most important constraints to chicken productivity are predators, which are caused by insufficient housing and a scavenging feeding system (24). They revealed that wild cats, eagles, and foxes are the most common chicken predators recognized by the chicken owners in the research locations in Benishangul-Gumuz, Western Ethiopia. Despite, there are many constraints that affect poultry production; there are also a couple of opportunities to improve village poultry production, such as market access, credit service, feed access, and extension service (25,26).

Major Ectoparasites of Backyard Chicken and Their Epidemiology

Fleas

Fleas are wingless, dark brown insects capable of jumping, with specialized mouthparts for piercing skin and drawing blood from their hosts. As adults, they are parasitic, while bird flea larvae feed on debris within nests. Fleas usually move through the host's feathers but are rarely found on the host itself; instead, they spend most of their time in the host's nest, climbing onto the host only for feeding or dispersal (27).

The stick-tight flea of chicken (*Echidnophaga gallinacea*) is a sedentary species that feeds on poultry in most tropical and sub-tropical parts of the world. These small fleas usually attack for extended periods at unfeathered host sites, for example, the head, comb wattle, and perennial region. They also attack the eyelids and induce irritation, restlessness, and anemia by their biting and sucking activities. Affected chickens may become blind when their nictating membranes are damaged. The presence of fleas is generally associated with dermatitis, pruritus, severe itching, and allergic reactions in infected hosts. Feeding activities of these fleas may result in significant blood loss, secondary infestations, pruritis, excoriation, and in some cases, premature death. They also act as vectors of pathogenic agents such as rickettsia (*Murine typhus*), bacterial disease (plague), and viral disease (myxomatosis) (28,29).

Some reports stated that poultry fleas are prevalent in different countries. Swai et al (29) reported that 71.9% of chickens were infected by *Echidnophaga gallinacean* (stick tight flea) in Nigeria, 73% were reported by Permin et al (12) in Zimbabwe, and 35.7% were reported by (2) in Nigeria; 56.0% and 76.7% were reported by Maina (30) in Kenya and (10), respectively. Some of the previous reports on the prevalence of chicken fleas in different parts of Ethiopia are listed below in Table 1.

Key flea control measures include removing infested litter and applying carbaryl, coumaphos, malathion, or pyrethroids to the litter surface to eliminate immature fleas. Stick-tight fleas can be managed through direct insecticide application. Another treatment method involves coating adult fleas with petroleum jelly, which kills attached fleas shortly after application (37).

Lice

Lice are common external parasites of birds that belong to the order Mallophagia, the chewing lice, and are characterized by possession of chewing-type mandibles located ventrally on the head, incomplete metamorphosis, no wings, a dorsoventrally flattened body, short antennae with three to five segments (34).

The chicken body louse, *Menacanthus stramineus*, is the most common and economically significant louse affecting both chickens and turkeys. It damages the host by puncturing soft feather quills near their base or gnawing the skin at the base of feathers to feed on blood. Chickens are also occasionally infested by other lice species, including *Menopon gallinae* (on feather shafts), *Lipeurus caponis* (primarily on wing feathers), *Cuclogaster heterographus* (mainly on the head and neck), *Goniocotes gallinae* (small, found in the fluff), *Goniocotes gigas* (the large chicken louse), *Goniocotes dissimilis* (the brown chicken louse), and *Menacanthus cornutus* (another body louse) (29,38).

Lice can also be found on caged birds infested by species of Mallophaga that are usually host-specific. Lice are usually introduced to poultry farms by infested equipment and unclean environments. 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 a site for secondary bacterial infections (39).

Some studies revealed the prevalence of chicken lice in different parts of the world. Bala et al. (40) reported that out of 160 examined chickens, 27.5% were infected with lice (8.1% Menopon *gallinae*, 6.9% *Menacanthus stramineus*, 5.0% *Lipeurus caponis*, 4.4% *Goniocotes gigas,* and 3.1% *Goniocotes gallinea) in* Nigeria; Lawal et al (41) reported that out of 400 examined chickens, 40.25% *Lipeurus caponis*, 14.0% *Menacanthus stramineus,* and 2.75% *Menopon gallinae* in Nigeria; and Swai et al (29) reported that out of 373 chicken samples examined, 28.5% of chickens were infected with *Menopon species* in Northern Tanzania. Chicken lice are mostly controlled by insecticidal dust formations of permethrin and carbaryl. Also, ivermectin drops on the feathers of poultry chickens are very effective against lice (11). Some of the existing reports on the prevalence of chicken lice infestation in various parts of the country are shown in Table 2.

Tick

The family Argasidae belongs to the fowl tick, which is also known as the soft-bodied tick and can be found in poultry houses. They lack a scutum, or dorsal head; the

Table 1. Previous Report on the Prevalence Of Chicken Fleas in Different Parts of Ethiopia

Study Area	No. of Examined Chickens	No. of Positive (%)	Identified Fleas Species	References
Jimma town	384	62 (16.15)	*Echidnophaga gallinacea*	(31)
Central Ethiopia	190	13 (6.8)	*Echidnophaga gallinacea*	(32)
Wolaita zone	768	84 (10.94)	*Echidnophaga gallinacea*	(33)
Dawro zone	384	269 (83.5)	*Echidnophaga gallinacea*	(34)
Jimma town	384	102 (26.6)	*Echidnophaga gallinacea*	(35)
Ambo town	390	173 (44.36)	*Echidnophaga gallinacea*	(11)
Guder town	1123	462 (41.1)	*Echidnophaga gallinacea*	(36)
Haramaya district	384	44 (11.5)	*Echidnophaga gallinacea*	(14)

Table 2. Previous Report on the Prevalence of Chicken Lice in Various Parts of Ethiopia

Study Area	No. of Examined Chickens	No. of Positive (%)	Identified Lice Species	References
Guder town	1123	55(4.8)	*Cuclotogaster heterographus*	(36)
		164 (14.6)	*Menacanthus stramineus*	
		27 (2.4)	*Menopon gallinae*	
Bishoftu town	384	48 (12.5)	*Menopon gallinae*	(13)
		51 (13.3)	*Menacanthus stramineus*	
		21 (5.5)	*Goniocotes gigas*	
		11 (2.9)	*Goniocotes gallinae*	
		10 (2.6)	*Lipeurus caponis*	
Wolaita zone	768	122 (12.6)	*Menacanthus stramineus*	(33)
		76 (9.9)	*Lipeurus caponis*	
		10 (1.3)	*Goniocotes gallinae*	
		13 (1.69)	*Menopon gallinae*	
Dawro zone	384	49 (44.95)	*Menopon gallinae*	(34)
		22 (20.18)	*Menacanthus stramineus*	
		17 (15.59)	*Lipeurus caponis*	
		7 (6.42)	*Goniocotes gallinae*	
		14 (12.84)	*Goniocotes gigas*	
Jimma town	384	72 (18.75)	*Lipeurus caponis*	(31)
		51 (13.28)	*Menopon gallinae*	
		19 (4.95)	*Menacanthus stramineus*	
		22 (5.73)	*Cuclotogaster heterographus*	

integument is leathery, wrinkled, and granulated in appearance, and the capitulum (head) is placed ventrally close to the body's anterior margin. There are three species in the genus *Argas*: *Argas radiates*, *Argas persicus*, and *Argas anchezi* (42).

According to the reports of Bala et al (40), 14.4% of fowl tick (*Argas persicus*) was identified from 160 examined chickens in Nigeria. 4.5% of *Argas persicus* was reported from 400 examined chickens in Nigeria by Lawal et al (41), and 23.9% of *Argas persicus* was reported from 373 examined chickens in Northern Tanzania by Swai et al (29). Some of the previous reports on the prevalence of fowl ticks in different parts of Ethiopia listed below in Table 3.

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. Ticks are also involved in chicken paralysis, a condition caused by a toxin found in the saliva of ticks. In cases of severe infestation, the birds will suffer anemia, blood loss, weight loss, and a drop in egg production. Fowl ticks have been reported to transmit *Aegyptianella pullorum* and fowl cholera (*Pasteurella multocida*) in some regions of the world (34). To control tick infestation, the environment should be treated with an approved acaricide. Also, proper measures should be taken in the construction of poultry houses to avoid cracks and crevices where ticks likely inhabit (27,30).

Table 3. Previous Report on Prevalence of Fowl Ticks in Different Parts of Ethiopia

Study Area	No. of Examined Chickens	No. of Positive (%)	Identified Mite Species	References
Wolaita Zone	450	6 (1.3)	*Argas persicus*	(43)
Central Ethiopia	190	8 (4.2)	*Argas persicus*	(32)
Dawro zone	384	16 (4.97)	*Argas persicus*	(34)

Mite

Mites can parasitize many animal species; some species spend their lives on one bird and feed actively on it, retreating to a nearby protected location after feeding (in cracks and crevices). The most economically important poultry mites are red chicken mites (*Dermanyssus gallinae*), northern fowl mites (*Ornithonyssus sylvarum*), tropical fowl mites (*Ornithonyssus bursa*), and scaly leg mites (*Knemidocoptes mutants)* (27).

Scaly-leg mites (*Knemidocoptes mutants*) are very small mites with an oval body and extremely short legs. It spends its entire life cycle burrowing into the featherless, scaly skin of the bird's legs, thighs, or beak. Due to its nature, it is rarely seen without the aid of a microscope, and the first indication of parasitism is a brittle, flaky, or powdery appearance to the birds' legs. Their presence stimulates host epithelial proliferation, resulting in hypertrophy and cornification. The legs become thick and distorted. If the infestation is severe, affected birds can become crippled. Their importance has increased over time due to resistance to acaricides, climate warming, and a lack of adequate control options (11,38).

The chicken mite (*Dermanyssus gallinae*) infests chickens, turkeys, pigeons, and wild birds. As a nocturnal feeder, it hides during the day in manure, on roosts, and within cracks and crevices of poultry housing, where it also lays eggs. Mite populations grow quickly during warmer months and slow down in colder weather (39).

The northern fowl mite (*Ornithonyssus sylviarum)* is the most prevalent and impactful permanent parasite of poultry across major production areas in the United States and is also a significant pest in other temperate regions. While similar in color to chicken mites (red to black), northern fowl mites are distinguishable by their daytime presence on poultry. Severe infestations can lead to blackened feathers from accumulated dried blood and mite excretions, typically near the vent, along with scabbed and cracked skin in that area (38,42).

Tropical fowl mite (*Ornithonyssus bursa*) is distributed throughout the warmer regions of the world and possibly replace the northern fowl mite in these regions. Hosts include poultry, pigeons, sparrows, and humans. The shape of the dorsal plate and the setae pattern distinguish

the tropical fowl mite from the northern fowl mite. There are three pairs of setae on the sternal plate of the tropical fowl mite (*Ornithonyssus bursa*) and only two pairs in the northern fowl mite (*Ornithonyssus sylviarum*). The northern fowl mite is a common external parasite of domestic fowl and wild birds throughout the temperate regions of the world (2).

According to Permin et al. (12), the prevalence of *Cnemidocoptes mutans* in laying hens was 32.5% in Zimbabwe; (44) reported that 7.26% of *Knemidocoptes mutants* were identified from 327 examined chickens in Nigeria. In another study of mites, Wang et al (45) assessed the prevalence and control of ectoparasites in China and found that the species *Dermanyssus gallinae* and *Ornithonyssus sylviarum* were present in 88.4% of 833 samples. Similarly, Rahbari et al (46) concluded that *Dermanyssus gallinae* was the most common mite in breeder and caged layer flocks in Iran. Some of the existing reports on the prevalence of mite infestation in chickens in different parts of the country are presented in Table 4.

Severe mite infestations can reduce reproductive potency in males, lower egg production in females, and lead to weight loss in young birds. Additionally, mites can cause anemia and, in extreme cases, death. Indirectly, they also pose a health risk by acting as vectors for diseases such as salmonellosis and *Erysipelothrix rhusiopathiae* (47).

Good sanitation practices are essential for preventing mite infestations in poultry, as they help to control mite population buildup. If infestation occurs, effective control involves spraying or dusting birds and litter with amitraz, carbaryl, malathion, or pyrethroid compounds provided the mites have not developed resistance to these treatments. Miticide spray must be applied with enough force to penetrate feathers, especially around the vent. Additionally, all areas where mites may hide, such as inside the poultry house, blind nest boxes, cracks, and crevices, should be treated (39).

Factors Supporting Distribution of Ectoparasites in Poultry Farms

Poor Management Practice

Poor sanitary conditions and the inability of poultry farmers to implement and execute control measures increase the impact of ectoparasites. However, this hinders chicken productivity and populations due to diseases caused by ectoparasite infections, ultimately leading to chicken death (10).

Inadequate Cleaning and Disinfection

Poor hygiene and lack of fumigation of poultry farm buildings and equipment increases the number of ectoparasites infesting poultry chickens and the risk of infectious diseases spread by these parasites (40,43).

Climate

Various climatic conditions (season, temperature, and humidity) aid ectoparasite infestation of poultry chickens, as some ectoparasites are more active during the winter and some in the summer. Fleas, lice, and ticks spend most of their life cycle on the host (chicken); therefore, they can infest poultry farms in any climatic conditions as an obligate parasite. However, mites hide in crevices and cracks and only infest poultry when they require blood meals, especially during winter when the population is very high (4).

Overcrowding

This involves packing large numbers of chickens in a cage not spacious enough for their inhabitation. This enables easy transportation or movement of ectoparasites from one chicken to the other simply by contact as they squeeze themselves to compete for space (40).

Poor House and Furniture Design

Building design significantly gives room to cracks and crevices, particularly as the buildings get old; poor construction of poultry houses with substandard materials and furniture creates cracks and crevices, which are hiding places and habitats for ectoparasites like mites, increasing ectoparasite populations on poultry. The movement from caged birds to enriched cages, free-range, and barn systems aims at improving the chicken's welfare; however, these conditions can also aid ectoparasite survival (18).

Prevention and Control of Ectoparasite of Backyard Chicken

The indigenous chicken's scavenging habits and constant

Table 4. Review on the Prevalence of Mite Infestation in Chickens in Different Parts of Ethiopia

Study Area	No. of Examined Chickens	No. of Positive (%)	Identified Mite Species	References
Ambo town	390	135(34.6)	*Knemidocoptes mutans*	(11)
Jimma town	384	7 (1.82)	*Knemidocoptes mutans*	(31)
		27 (7.03)	*Dermanyssus gallinae*	
Wolaita zone	450	110 (24.4)	*Knemidocoptes mutans*	(43)
		7 (1.6)	*Cnemidocoptes gallinea*	
Bishoftu town	384	8 (2.1)	*Ornithonyssus sylviarum*	(13)
Wolaita Zone	768	33 (4.3)	*Knemidocoptes mutans*	(33)

contact with a contaminated environment make them easy prey for parasitic infestations, making their control a major obstacle for rural farmers. Preventing disease transmission by isolating poultry flocks from other animals; keeping wild birds, rodents, insects, and pets away from poultry is almost impossible due to the nature of their production system (free-range system). When the pests are discovered and identified, effective control will entail collective alternatives. This control can be approached as on-host and/or off-host treatment (10).

Some techniques have been used in the control of these ectoparasites which include: Cultural control, chemical control, mechanical control, genetic control, and integrated pest management. Entry of wild birds and rodents can be prevented with screens and other barriers. However, cultural methods like paraffin used in the control of fleas (*Echidnophaga gallinacea*) and petroleum jelly applied on scaly legs mite (*Cnemidocoptes mutans*); and traditional herbs like neem (mwarubaini) leaves and bark have been employed in the control of ectoparasites in Indigenous family chicken (27).

Some reports revealed that some farmers use plant herbs to control and prevent ectoparasites in poultry. According to Wodegebriel et al (48-52), poultry owners used different plant herbs, like Kundoberbere and Woira, by boiling the leaves and fumigating the chicken house to control and prevent ectoparasites of chickens (53-57).

Conclusion and Recommendations

This review underscores the significant challenge posed by ectoparasites to backyard chicken production in rural Ethiopia. The prevalence of ectoparasites, such as mites, lice, ticks, and fleas, is high, contributing to substantial economic losses and health risks to chickens. The identified impacts include reduced growth rates, decreased egg production, and increased mortality, which directly affect household incomes and food security. Additionally, the transmission of zoonotic diseases poses a public health risk, underlining the importance of effective ectoparasite management strategies.

- Stakeholders implement comprehensive ectoparasite management programs that include regular monitoring, appropriate use of antiparasitic treatments, and improved biosecurity measures to reduce parasite prevalence.
- Educating poultry keepers about the importance of ectoparasite control, recognizing signs of infestation, and appropriate treatment methods can enhance awareness and prompt action against ectoparasites.
- Strengthening collaboration between local veterinary services and poultry keepers can facilitate access to diagnostic services, treatment advice, and technical support to manage ectoparasite infestations effectively.

Authors' Contribution

Conceptualization: Nuguse Refisa, Tesfaye Rebuma.
Data curation: Nuguse Refisa.
Formal analysis: Tesfaye Rebuma.
Investigation: Tesfaye Rebuma.
Methodology: Nuguse Refisa, Tesfaye Rebuma.
Project administration: Nuguse Refisa.
Resources: Nuguse Refisa, Tesfaye Rebuma.
Software: Nuguse Refisa, Tesfaye Rebuma.
Supervision: Tesfaye Rebuma.
Validation: Tesfaye Rebuma.
Visualization: Nuguse Refisa, Tesfaye Rebuma.
Writing–original draft: Nuguse Refisa, Tesfaye Rebuma.
Writing–review & editing: Tesfaye Rebuma.

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References

1. Alders RG, Pym RA. Village poultry: still important to millions, eight thousand years after domestication. Worlds Poult Sci J. 2009;65(2):181-90. doi: 10.1017/s0043933909000117.
2. Nnadi PA, George SO. A cross-sectional survey on parasites of chickens in selected villages in the subhumid zones of south-eastern Nigeria. J Parasitol Res. 2010;2010:141824. doi: 10.1155/2010/141824.
3. CSA/Central Statistical Agency of the Federal Democratic Republic of Ethiopia. Agricultural Sample Survey Report on Livestock and Livestock Characteristics. (Private Peasant Holdings). Addis Ababa, Ethiopia: Ethiopian Central Statistical Agency; 2021.
4. Belihu K, Mamo A, Lobago F, Ayana D. Prevalence of ectoparasites in backyard local chickens in three agroecologic zones of East Shoa, Ethiopia. Rev Med Vet (Toulouse). 2009;160(11):537-41.
5. Tadelle D, Million T, Alemu Y, Peters KJ. Village chicken production systems in Ethiopia: 1. Flock characteristics and performance. Livest Res Rural Dev. 2003;15(1):1-10.
6. Gebre-Egziabher MM. Characterization of Smallholder Poultry Production and Marketing System of Dale, Wonsho and Loka Abaya Weredas of southern Ethiopia [dissertation]. Hawassa University; 2007.
7. Dessie T, Ogle B. Village poultry production systems in the central highlands of Ethiopia. Trop Anim Health Prod. 2001;33(6):521-37. doi: 10.1023/a:1012740832558.
8. Dinka H, Chala R, Dawo F, Bekana E, Leta S. Major constraints and health management of village poultry production in Rift Valley of Oromia, Ethiopia. Am Eurasian J Agric Environ Sci. 2010;9(5):529-33.
9. Tesfaheywet Z, Amare E, Hailu Z. Helminthosis of chickens in selected small-scale commercial poultry farms in and around Haramaya Woreda, Southeastern Ethiopia. J Vet Adv. 2012;2(9):462-8.
10. Mungube EO, Bauni SM, Tenhagen BA, Wamae LW, Nzioka SM, Muhammed L, et al. Prevalence of parasites of the local scavenging chickens in a selected semi-arid zone of Eastern Kenya. Trop Anim Health Prod. 2008;40(2):101-9. doi: 10.1007/s11250-007-9068-3.
11. Tamiru F, Dagmawit A, Askale G, Solomon S, Morka D, Waktole T. Prevalence of ectoparasite infestation in chicken

in and around Ambo town, Ethiopia. J Vet Sci Technol. 2014;5(4):189. doi: 10.4172/2157-7579.1000189.
12. Permin A, Esmann JB, Hoj CH, Hove T, Mukaratirwa S. Ecto-, endo- and haemoparasites in free-range chickens in the Goromonzi district in Zimbabwe. Prev Vet Med. 2002;54(3):213-24. doi: 10.1016/s0167-5877(02)00024-7.
13. Kebede W, Furgasa W, Abdeta D. Investigation of major ecto-parasite affecting backyard chicken in Bishoftu town, Ethiopia. Journal of Medicine and Healthcare. 2021;3(1):1-9. doi: 10.47363/jmhc/2021(3)143.
14. Serda B, Abdi M. Prevalence of ectoparasites infestation in poultry in Haramaya district, Eastern Hararghe zone; Oromia region, Ethiopia. J Vet Sci Technol. 2018;9(3):546. doi: 10.4172/2157-7579.1000546.
15. Iposu SO, Okwelum N, Sanni Ridwan O, Sanwo K, Oduguwa BO. Prevalence of mites and fleas as primary turkey ectoparasites in Odeda local government area of Ogun state, Nigeria. Glob J Biol Agric Health Sci. 2013;3(3):154-7.
16. Asgedom AH. Village Poultry in Ethiopia: Socio-Technical Analysis and Learning with Farmers. Wageningen University and Research; 2007.
17. Dana N, Dessie T, van der Waaij LH, van Arendonk JAM. Morphological features of indigenous chicken populations of Ethiopia. Anim Genet Resour. 2010;46:11-23. doi: 10.1017/s2078633610000652.
18. Moges FA. Studies on Production and Marketing Systems of Local Chicken Ecotypes in Burie Wereda, North West Amhara [dissertation]. Hawassa University; 2009.
19. Moges F, Mellesse A, Dessie T. Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. Afr J Agric Res. 2010;5(13):1739-48.
20. Mengesha M, Tamir B, Dessie T. Village chicken constraints and traditional management practices in Jamma district, South Wollo, Ethiopia. Livest Res Rural Dev. 2011;23(2):30-7.
21. Mohammed A. Major constraints and health management of village poultry production in Ethiopia: review school of veterinary medicine, Jimma University, Jimma, Ethiopia. Int J Res Stud Microbiol Biotechnol. 2018;4(1):1-10. doi: 10.20431/2454-9428.0401001.
22. Melesse A, Negesse T. Study on the characterization of local chickens found in southern Ethiopia. In: Proceedings of Annual Research Review Workshop, Hawassa University, College of Agriculture, Hawassa, Ethiopia; 2009. p. 16-7.
23. Waktole H, Almaw M, Taweya D, Wakjira B, Kiflom M, Ashenafi H. Opportunities and challenges of indigenous chicken in Asella district, Arsi zone, Oromia, Ethiopia: implications for designing improved productivity schemes. J Bacteriol Mycol Open Access. 2018;6(3):229-35.
24. Alemayehu A, Yilma T, Shibeshi Z, Workneh T. Village chicken production systems in selected areas of Benishangul-Gumuz, Western Ethiopia. Asian J Poult Sci. 2015;9(3):123-32. doi: 10.3923/ajpsaj.2015.123.132.
25. Assefa F, Tadesse T, Dancho A. Challenges and opportunities of village poultry production in Arbegona Woreda, Sidama zone, southern Ethiopia. Developing Country Studies. 2015;5(11):71-8.
26. Bekuma A, Tadesse A. Study on productive performances, constraints, and opportunities of improved chicken under village production system in West Shewa zone, Ethiopia. Adv Agric. 2022;2022(1):6354158. doi: 10.1155/2022/6354158.
27. Onyekachi O. Prevalence of ectoparasites infestation of chicken in three poultry farms in Awka. Asian Basic Appl Res J. 2021;3(1):41-53.
28. Mbaya AW, Nwosu CO, Aliyu MM. Parasites and associated packed cell volume changes of captive wild birds in the semi-arid region of north-eastern Nigeria. Niger J Parasitol. 2007;28(2):109-13. doi: 10.4314/njpar.v28i2.37867.
29. Swai ES, Kessy M, Sanka P, Bwanga S, Kaaya JE. A survey on ectoparasites and haemoparasites of free-range indigenous chickens of Northern Tanzania. Livest Res Rural Dev. 2010;22(9):1-4.
30. Maina AN. Prevalence, Intensity and Lesions Associated with Gastro-Intestinal Parasites of Indigenous Chickens in Kenya [dissertation]. University of Nairobi; 2005.
31. Kebede A, Abebe B, Zewdie T. Study on prevalence of ectoparasites of poultry in and around Jimma town. Eur J Biol Sci. 2017;9(1):18-26. doi: 10.5829/idosi.ejbs.2017.18.26.
32. Ashenafi H, Yimer E. Ectoparasites of local scavenging chickens of central Ethiopia. Ethiop J Sci. 2005;28(1):69-74. doi: 10.4314/sinet.v28i1.18235.
33. Wondimu HE. Prevalence and associated risk factors of ectoparasites in chickens in extensive and intensive farms in Wolaita zone, Ethiopia. Int J Adv Multidiscip Res. 2021;8(4):30-64. doi: 10.22192/ijamr.2021.08.04.004.
34. Tessema W. Study on prevalence of ectoparasites in poultry managed under backyard system in Mareka Woreda of Dawuro zone, Snnpr, Ethiopia. ARC J Anim Vet Sci. 2019;5(2):1-8. doi: 10.20431/2455-2518.0502001.
35. Mata W, Galgalo W, Jilo K. Prevalence of the major ectoparasites of poultry in extensive and intensive farms in Jimma, Southwestern Ethiopia. J Parasitol Vector Biol. 2018;10(7):87-96. doi: 10.5897/jpvb2017.0298.
36. Rebuma T, Girma W, Regassa M, Gemechu Z, Pal M. Prevalence of parasitic infestation of poultry presented at Guder Mamo Mezemir Campus Veterinary Teaching Clinic, Guder, Oromia regional state, Ethiopia. Int J Livest Res. 2024;14(9):20-6.
37. Jacob J, Pescatore T. Common External Parasites of Poultry. Cooperative Extension Service ASC-206. University of Kentucky College of Agriculture, Food and Environment; 2017. p. 1-4.
38. James RP. The Merck, veterinary manual; Merck sharp ectoparasites and classifications. Revised Science Technology Publication; 2013.
39. Khan CM, Scott L, Dana GA, Dave PA, Leo BJ, Katherine EQ. Merck's Veterinary Manual. 9th ed. Merck & Co; 2005. p. 2582-3.
40. Bala AY, Anka SA, Waziri A, Shehu H. Preliminary survey of ectoparasites infesting chickens (*Gallus domesticus*) in four areas of Sokoto metropolis. Niger J Basic Appl Sci. 2011;19(2):173-80.
41. Lawal JR, Yusuf ZB, Dauda J, Gazali YA, Biu AA. Ectoparasites infestation and its associated risk factors in village chickens (*Gallus gallus domesticus*) in and around Potiskum, Yobe state, Nigeria. Journal of Animal Husbandry and Dairy Science. 2017;1(1):8-19.
42. Calnek BW, Barnes HJ, Beard CW, McDougald LR, Saif YM. Diseases of Poultry. Ames, Iowa: Iowa State University Press; 1997. p. 675-83.
43. Zeryehun T, Yohannes Y. Ectoparasite infestation of free scavenging chickens reared under traditional backyard production system in Wolayita zone, southern Ethiopia. Ethiop Vet J. 2015;19(2):55-66. doi: 10.4314/evj.v19i2.2.
44. Odenu RA, Mohammed BR, Simon MK, Agbede RI. Ecto-parasites of domestic chickens (*Gallus gallus domesticus*) in Gwagwalada area council, Abuja, Nigeria-West Africa. Alex J Vet Sci. 2016;51(1):140-6. doi: 10.5455/ajvs.220654.
45. Wang FF, Wang M, Xu FR, Liang DM, Pan BL. Survey of prevalence and control of ectoparasites in caged poultry in China. Vet Rec. 2010;167(24):934-7. doi: 10.1136/vr.c6212.

46. Rahbari S, Nabian S, Ronaghi H. Haematophagus mites in poultry farms of Iran. Iran J Arthropod Borne Dis. 2009;3(2):18-21.
47. Chirico J, Eriksson H, Fossum O, Jansson D. The poultry red mite, *Dermanyssus gallinae*, a potential vector of *Erysipelothrix rhusiopathiae* causing erysipelas in hens. Med Vet Entomol. 2003;17(2):232-4. doi: 10.1046/j.1365-2915.2003.00428.x.
48. Wodegebriel YW, Abebe BF, Tamir A. Medicinal plants used by farmers for treatment of major diseases of chicken in South Wollo zone, Amhara region, Ethiopia. Int J Adv Res Biol Sci. 2018;5(10):45-58. doi: 10.22192/ijarbs.2018.05.10.004.
49. Ghaffar RA, Zulfiqar S, Hassan HU, Fadladdin YA, Sohail M, Kabir M, et al. New record of *Philometra* species from the marine edible fish *Terapon jarbua* collected from the Sindh, Arabian Sea, Pakistan. Braz J Biol. 2024;84:e281415. doi: 10.1590/1519-6984.281415.
50. Fadladdin YA, Ullah A, Nawaz R, Garedaghi Y, Al-Azab AM, Aldamigh MA. Prevalence of nematode infection among school children of district Malakand, Pakistan. Pak J Nematol. 2024;42(1):25-33. doi: 10.17582/journal.pjn/2024/42.1.25.33.
51. Ghorbani A, Jannati R, Garedaghi Y, Tavakoli Pasand S. A systematic review of serological and surgical cases of human hydatid cysts between 2003 and 2023 in Fars province, southern Iran. J Zoonotic Dis. 2024;8(1):413-21. doi: 10.22034/jzd.2023.17333.
52. Hariri D, Garedaghi Y. Comparison of therapeutic effects of hydroalcoholic extract of asafoetida with metronidazole in mice infected with *Giardia lamblia*. J Zoonotic Dis. 2024;8(1):452-9. doi: 10.22034/jzd.2024.17396.
53. Santiago-Figueroa I, Lara-Bueno A, González-Garduño R, Mendoza-de Gives P, Delgado-Núñez EJ, de Jesús Maldonado-Simán E, et al. Anthelmintic evaluation of four fodder tree extracts against the nematode *Haemonchus contortus* under in vitro conditions. Rev Mex Cienc Pecu. 2023;14(4):855-73. doi: 10.22319/rmcp.v14i4.6339.
54. Garedaghi Y, Firouzivand Y, Hassanzadeh Khanmiri H, Shabestari Asl A. A review of the most important antiparasitic compounds effective on human fascioliasis from the past until now. Curr Drug Ther. 2023;18(5):365-76. doi: 10.2174/1574885518666230403111528.
55. Garedaghi Y, Khaki A, Feizi A, Abbas Raza SH, Khan R, Hao L, et al. Epidemiological and pathological studies on the helminthic parasites in native chickens of Tabriz city, Iran. Genet Mol Res. 2017;16(4):gmr16039824. doi: 10.4238/gmr16039824.
56. Garedaghi Y, Firouzivand Y, Heikal Abadi M. Assessment of *Neospora caninum* seroprevalence in buffalo in Tabriz city, north-west of Iran. Buffalo Bull. 2017;36(2):379-84.
57. Garedaghi Y, Firouzivand Y, Luca I. Prevalence of endoparasites and their zoonotic significance in wild rabbits of Ahar city, Iran. Am J Anim Vet Sci. 2022;17(1):31-4.