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Volume 7 (3); 25 May 2017

Review

Review on the Status, Characterization and Conservation Methods of Local Chicken Ecotypes, Ethiopia.

Getu A, and Alemayehu K.

Online J. Anim. Feed Res., 7(3): 43-50, 2017; pii: S222877011700008-7

Abstract

Review work was conducted to assess the characterized and conservation methods of indigenous chickens in Ethiopia. In Ethiopia Chickens are the most wide spread and dominant poultry species. Since local chickens have good potential to adapted in different agro-ecology and provide luxurious source of family protein and income to rural poor. However, village chicken is usually kept under free ranging production system. Still those local chickens are non descriptive type and show variations in body position, color, comb type and productivity. Indigenous chickens have characterized as; poor appearance, relatively low productivity, slow growth rate, small adult size and lays small egg. So, they are neglected from researchers, development workers and policy makers to put them in the research and development. To decrease loose of chicken genetic resource, phenotypic and genotypic characterization work were conducted. However, many chickens are lack with information about their geographical distributions and its availability. Many previous reports underlined that the breed characteristics of indigenous chickens are vary in color, comb type, body conformation and weight. High incidences of chicken diseases, mainly (NCD), coccidioses, salmonellae's fowl pox are the major and economically important constraint for village chicken production system following feeds and predators. Further constraints are poor access to markets, weak institutions, and lack of skills and knowledge which lead to high rate of genetic erosion. According to DAD-IS and DAGR-IS, the evidences about the genetic resource of identified chickens are undocumented and unobserved as well, only small number of chickens ecotype such as Tilili, Horro, Chefe, Jarso, Tepi, Gelila, Debre-Elias, Melo-Hamusit, Gassay/Farta, Guangua, Mecha, Konso, Mandura, and Sheka are the major identified and characterized type of local chicken ecotypes in Ethiopia. Therefore, conservation practices are not common rather than aggravating the erosion of local chicken resources through random distribution of exotic chickens.

Keywords: Chickens, Conservation, Indigenous

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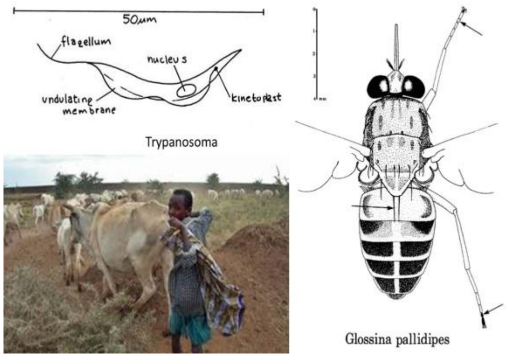
Research Paper

Prevalence of bovine trypanosomosis and its vector density in Sheka zone, Anderacha Woreda.



Yigzaw B, Asmare T, Derso S.

Online J. Anim. Feed Res., 7(3): 51-57, 2017; pii: S222877011700009-7

Abstract

A cross sectional study was conducted in Andracha woreda Sheka Zone of South western Ethiopia to determine the prevalence and associated risk factors of bovine trypanosomiasis using parasitological and entomological study. It was conducted from November, 2015 to April, 2016. Blood samples from randomly selected 383 cattle of both sex and different age groups were collected and examined with hematological and parasitological techniques. Out of the total examined cattle, 8(2.1%) were infected with trypanosomes. The highest infections were due to *Trypanosoma conglense* (1.3%) followed by mixed infection (0.52%) and *Trypanosoma brucei* (0.26%). The disease was more prevalent (2.3%) in females than in male cattle (0.2%). There were no statistically significant difference among / between age and sex groups ($P > 0.05$). The mean PCV (%) values during the study period were 23.38 ± 1.51 in parasitaemic and 30.02 ± 0.14 in aparasitaemic animals, which was found statistically significant ($P < 0.05$). *Glossina pallidipes* were the only fly species caught during the study period and the entomological monitoring showed that the apparent density (expressed as flies per trap per day, i.e. f/t/d) of *Glossina Pallidipes* in the study area were 0.83, 0.89, 1.11 and 0.44 at Yokchichi, Gemadro, Beshifa and Shebena, respectively; with the overall apparent density of 0.82. Since it is endemic diseases, strategic control of bovine trypanosomiasis including vector control should be strengthened to improve livestock production in this area.

Keywords: Trypanosoma, prevalence, Glossina, PCV, Anderacha woreda, Sheka, Ethiopia

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Research Paper

Stomach adaptations of broilers fed *Acacia angustissima* leaf meal based diets.

Ncube S, Halimani TE, Tivapasi MT, Dhliwayo S, Chikosi E V-I and Tapiwa Saidi P.

Online J. Anim. Feed Res., 7(3): 58-64, 2017; pii: S222877011700010-7

Abstract

The study determined effect of *Acacia angustissima* leaf meal on the stomach physiology of broilers. 150 day old chicks were randomly allocated to 0%, 5% *and* 10% *A. angustissima* leaf meal based diets for six weeks with five replicates per treatment. At weeks 2, 4 and 6, two birds from each replicate were slaughtered, dressed and weighed. The weights of the proventriculus and gizzard were measured. Approximately 1 cm specimen was taken from each organ, fixed in formalin and stained for histological analysis using a light microscopy. Proventriculus muscle layer thickness, gland diameter and secretory layer thickness decreased with increasing leaf meal levels (P < 0.05). *A. angustissima* leaf meal had no effect on the physiology of the gizzard during the starter phase (P>0.05). Continued use of the of *A. angustissima* leaf meal in the grower and finisher diets resulted in increased weight and muscle thickness of the gizzard (P < 0.05). It was concluded that *A. angustissima* leaf meal reduced the physiological capacity of the proventriculus to secrete digestive juices and enhanced the physiological capacity of the gizzard for mechanical digestion.

Keywords: *Acacia angustissima*, Broilers, Gizzard, Grinding capacity, Proventriculus

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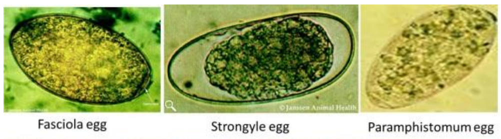
Research Paper

Small ruminant GIT parasites in Enemay District, East Gojjam: Prevalence and risk factors.



Derso S and Shime A.

Online J. Anim. Feed Res., 7(3): 65-71, 2017; pii: S222877011700011-7

Abstract

A cross sectional study was conducted to determine the prevalence and risk factors associated with small ruminants GIT helminthes parasites in Enemay district, East Gojjam, Northwest of Ethiopia from October, 2013 to April, 2014 based on coprological examination. A total of 384 small ruminants' faecal samples (248 sheep and 136 goats) were collected and examined using standard parasitological procedures of sedimentation and flotation techniques. The present study revealed that the overall prevalence of the major gastrointestinal tract (GIT) helminthes parasite was 229 (59.63%). Out of 229 positive samples the species of parasites were found *Strongyle* (22.9%), *Fasciola* (14.1%), *Paramphistomum* (7.03%), *Monesia* (5.73%) and as mixed infection (9.9%). *Strongyles* were the most prevalent parasites encountered in the area followed by *Fasciola*. The study showed that 63.7% and 52.2 % of sheep and goats, respectively were infected with one or more helminthes and higher prevalence was observed in sheep than goats and there was statically significant (P < 0.05) between them. Female animals were found with higher prevalence of helminthes infection rate than male animals with a prevalence of 59.9% and 40.1%, respectively and there was statically significant (P < 0.05) between sex. Higher prevalence was observed in young animal than adult animal in this study and the prevalence was 67.9% and 53.6%, respectively. There was statically significant (P < 0.05) between age group. The study showed that higher prevalence of helminthic infection was observed in poor body condition animals as compared to medium and good body condition animals and their prevalence were 89.9%, 59% and 44% respectively. There was highly statically significant (P < 0.000) between body condition of the animal. In Conclusion the animal was affected by different helminthes parasites infections which cause loss of production, reducing growth rate and death of small ruminants. The animal owner should be deworming their small ruminants by different anthelmintics based on order of the Veterinarian to avoid drug resistance as recommendation.

Keywords: GIT helminthes, Prevalence, Small ruminants, Enemay district, Ethiopia

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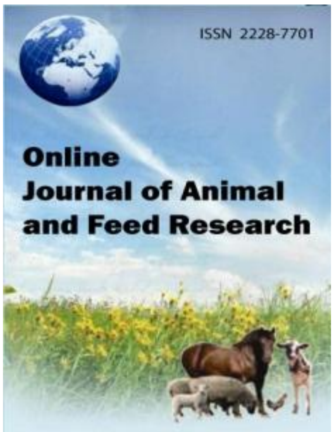

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REVIEW ON THE STATUS, CHARACTERIZATION AND CONSERVATION METHODS OF LOCAL CHICKEN ECOTYPES, ETHIOPIA

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ABSTRACT: Review work was conducted to assess the characterized and conservation methods of indigenous chickens in Ethiopia. In Ethiopia Chickens are the most wide spread and dominant poultry species. Since local chickens have good potential to adapted in different agro-ecology and provide luxurious source of family protein and income to rural poor. However, village chicken is usually kept under free ranging production system. Still those local chickens are non descriptive type and show variations in body position, color, comb type and productivity. Indigenous chickens have characterized as; poor appearance, relatively low productivity, slow growth rate, small adult size and lays small egg. So, they are neglected from researchers, development workers and policy makers to put them in the research and development. To decrease loose of chicken genetic resource, phenotypic and genotypic characterization work were conducted. However, many chickens are lack with information about their geographical distributions and its availability. Many previous reports underlined that the breed characteristics of indigenous chickens are vary in color, comb type, body conformation and weight. High incidences of chicken diseases, mainly (NCD), coccidioses, salmonellae's fowl pox are the major and economically important constraint for village chicken production system following feeds and predators. Further constraints are poor access to markets, weak institutions, and lack of skills and knowledge which lead to high rate of genetic erosion. According to DAD-IS and DAGR-IS, the evidences about the genetic resource of identified chickens are undocumented and unobserved as well, only small number of chickens ecotype such as Tilili, Horro, Chefe, Jarso, Tepi, Gelila, Debre-Elias, Melo-Hamusit, Gassay/Farta, Guangua, Mecha, Konso, Mandura, and Sheka are the major identified and characterized type of local chicken ecotypes in Ethiopia. Therefore, conservation practices are not common rather than aggravating the erosion of local chicken resources through random distribution of exotic chickens.

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INTRODUCTION

In Ethiopia, village chicken production systems usually kept under free range system and their feed is obtained through scavenging. The major feed resource are insects, worms, seeds and plant materials, with very small amounts of grain and table leftover supplements from the household (Tadelle and Ogle, 2000; Bogale, 2008). These scavenging chickens are the most widespread which provide important source of family protein and incomes (Tadelle et al., 2003). At country level local chicken are estimated as 49.3 million (CSA, 2011). Local chickens are non descriptive type show a large variation in body position, color, comb type and productivity which also attributed to their widespread distribution and huge population size (Tadelle et al., 2003; Halima, 2007, Fisseha et al., 2010b). Ethiopia is the home of domestic animal migration from Asia to Africa which plaid a great impact to widespread distribution in a country (Halima, 2007). Adaptation of harsh environment and resistance to disease are the major opportunities of local chicken in Ethiopia and contributed to the national economy in general and the

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rural economy in particular 99.2% of meat and 99% of egg productions are contributed by local chickens with an average annual output of 72,300 and 78,000 metric tons of meat and egg production respectively (Tadelle et al., 2003; Hailemariam et al., 2006; Fisseha et al., 2010b). However, indigenous chickens are poor appearance, relatively low productivity, slow growth rate, small adult size and lays small egg size (Pedersen, 2002; Gondwe, 2004). Due to this effect they are not getting attention by concerned bodies (Tadelle et al., 2003; Mekonnen, 2007). Therefore the genetic resources in some part of Ethiopia are becoming critically endangered (Halima, 2007; Dana et al., 2010 and Dana, 2011). Furthermore, the extensive and random distribution of exotic chicken breeds is cause of dilution in indigenous chickens (Tadelle et al., 2003). To reduce looses of chicken genetic resource, some workers have made phenotypic and genotypic characterization of indigenous chicken in some parts of Ethiopia (Tadelle et al., 2003; Halima, 2007; Dana et al., 2010 and Dana, 2011). Therefore the objective of this paper is to assess the status, characterization and conservation practice of indigenous chicken in Ethiopia and to identify risk of their extinction.

Chicken Population in Ethiopia

Ethiopia is one of African countries with a significant population of chicken and covers about 60% of the total population (Mekonnen et al., 1991). The domesticated poultry species are the part of livestock population. Recently, chickens are estimated to be about 49.3 millions of which 97.3%, 0 .38 % and 2.32 % of the total chickens are indigenous, hybrid and exotic respectively (CSA, 2011). This report revealed that chicken includes cocks, cockerels, pullets, laying hens, non-laying hens and chicks.

In Ethiopia, the rural farm households do not keep other domesticated birds (Bogale, 2008). The same study indicated that the mean number of breeding females per households was 5.4 ± 2 and the overall male to female ratio of the village flocks was: 1:2.5.

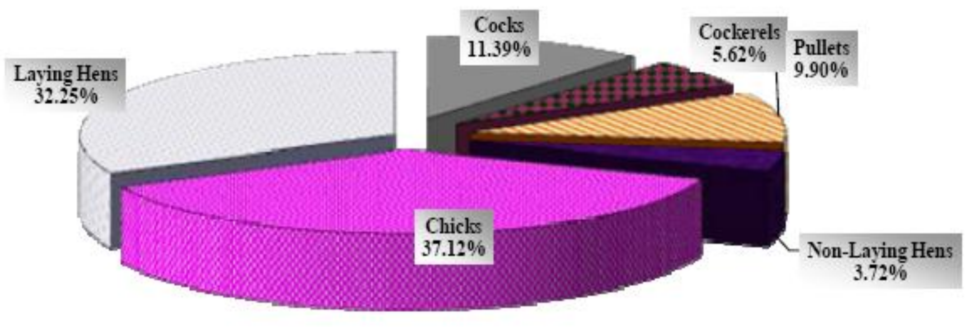

Figure 1. Distribution of chicken population by type in Ethiopia. (Source: CSA, 2011)

Geographical Distributions and Classification of Indigenous Chickens in Ethiopia

There is no complete information about the geographical distributions of many chickens in the developing countries of the world thus some of them are commonly referred to as non-descript breeds (FAO, 2011). Ethiopian local chickens are none descriptive (none have common defined name). As a result breed characteristics of local chickens are vary in color, comb type, body conformation and body weight (Alemu and Tadelle, 1997; Meseret, 2010). The diversity of Ethiopian local chicken shows variation in morphology, color etc and their name is given based on name of place where they are found. Based on their color, the local chicken ecotype classified and named as: *Tukor* (black), *Melata* (nacked nack), *Kei* (red), *Gebsima* (mixed) and *Netch* (white). Based on feather morphology local chicken ecotypes are categorized as skin color (silky, white & yellow), Comp type (single, rose, pea, walnut & duplex) and Body shape (blocky, triangular & wedge) (Dana et al., 2010). Dana (2011) reported that local chickens are characterized by pronounced broodiness (maternal instinct), slow growth rate, late sexual maturity and low production performance.

Importance of Poultry Productions

Word poultry refers to all domesticated birds that are reared for the production of meat and eggs for human consumption as well as for economic benefits. Village chicken production systems are characterized by low input-low output levels and free range production systems (Bogale, 2008). Indigenous chicken provides relevant contributions for poverty alleviation by adapting different agro - ecology, resistance to disease and supplying high

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quality protein to balance the family food supply, and provide small disposable cash income in addition to the socio-religious functions that are important in the rural people's lives under lack of supplementary feed and other managemental problems. Due to the importance of local chicken, characterizing and conservation of indigenous chicken genetic resource are mandatory (Tadelle et al., 2003b). Chicken production is an appropriate and locally available resource on livestock populations. In Africa chicken population is the highest and every rural poor participated in an extensive production system (Tadelle et al., 2003b). From sub-Saharan Africa, 85% of all households keep chicken under free range/ extensive production system, with women owning 70% of it, providing insufficient animal protein in the form of meat and eggs as well as reliable source of cash income (Swan and Sonaiya, 2004). Ethiopia is one of the few African countries which have large chicken population of 60% of the total free range population in Africa (Mekonnen et al., 1991). However, the number of chicken flocks per household in most Ethiopian rural communities is small constituting an average of 7–10 mature chicken, 2–4 adult hens, a male bird (cock) and a number of growers of various ages (Tadelle and Ogle, 2000). Traditional production system of local chickens is common and characterized by their low input and low output levels no feed supplementation, small flock size and periodic devastation of the size by disease and other constraints (Tadelle and Alemu, 1997; Meseret, 2010).

Performance of Indigenous Chicken

Some workers reported that indigenous chickens are poor appearance, low performance and produce small sized eggs, slow growth rate, late maturity and slow age at first mating, small clutch size, and high mortality of chicks (Bogale, 2008; Fisseha, 2009; Meseret, 2010). In different part of Ethiopia, comprehensive report stated that phenotypic performance of local chickens are varied because of genotype, management and seasons, such as egg production performance; described in 30 to 60 eggs/hen/yr (Kidane, 1980) at WADU, 34 eggs /hen/yr (Brannang and Pearson, 1990) at Asella, 18-57 eggs/year/ hen Halima (2007) at Northwest Ethiopia, 20-60 eggs/3cluch/yr (Bogale, 2008) at Fogera, 10.05 ± 0.15egg/clutch 3.78 ± 0.07/yr (Fisseha, 2009) at Bure and the other recent study reported local chicken eggs laid ranges from 53-60 egg/hen/yr range of 43.2-46.96 egg weight (Fisseha et al., 2010a) at North-west Ethiopia.

Major Constraints of Poultry Production in Ethiopia

High incidence of chicken diseases, mainly (NCD) is the first and economically important constraint for village chicken production system following by feeds (Dana and Ogle, 2000; Halima, 2007). The other comprehensive study showed that (NCD) is highly infectious and more losses than any other diseases in the tropics and it spreads rapidly through the flock and mortality could reach up to 100% (Dana et al., 2003; Serkalem et al., 2005; Nwanta et al., 2008). Among infectious diseases, Salmonelloses, coccidioses and fowl pox are also considered to be the most important causes of mortality in local chicken while predators are an additional causes of loss (Eshetu et al., 2001). According to Tadelle and Ogle (2000), high mortality of chicks under village chicken production in the central highlands of Ethiopia is due to diseases, parasites, predation, lack of feed, poor housing and insufficient water supply. Further village poultry production is constrained by poor access to markets, goods and services, weak institutions, and lack of skills, knowledge and appropriate technologies (Gueye, 2003). Besbes (2009) reported that poor nutrition and health problems are the main constraints. In addition to the above extensive and random introduction of exotic breeds before appropriate characterization, utilization and conservation of indigenous genetic resources is believed to be the main cause of the loss of indigenous resource (Halima, 2007; Besbes, 2009).

Phenotypic Characterization of Indigenous Chicken

Phenotypic characterization is affected by agro-climates, ethnic groups, socio- economic, religious and cultural influences in the nature of the qualitative and quantitative traits variation (Halima, 2007). Ethiopia is gateways of domestic animals migration from Asia to Africa and it has further impact on the diversity of Ethiopian chickens (Halima, 2007). According to (FAO, 2011) stated that diversified chicken characterization is identifying distinct Animal Genetic Resource /AnGR/ and describing their uniqueness in their environment within specific location and describes any measurable (quantitative trait), adaptable and observable (qualitative) nature of AnGR and evaluate effective population size and evaluates status their risks (FAO, 2011). Different report stated that indigenous chickens are characterized in different parts of Ethiopia; Teketel (1986) at Awassa/Sidamo; (Bogale, 2008) at Fogera District (based on plumage colors as, white, red, black, grayish, brown, white brownish, black brownish, and red brownish), (Fisseha, 2009) at Bure (characterized based on their phenotypic variations in terms of plumage color, shank length, comb type and growth performances). Based on location (Tadelle, 2003) at Tilili, Horro, Chefe, Jarso and Tepi, (Halima, 2007) at Tilili, Gelila, Debre-Elias, Melo-Hamusit, Gassay/Farta, Guangua and Mecha (Dana, 2011) characterized at Farta, Konso, Mandura, Horro and Sheka. However, only 5 chickens are listed

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in DAD-IS FAO (2008) and 10 in DAGR-IS (DAGRIS, 2008) including those listed in DAD-IS. This small number represented in the databases indicates that locally adapted populations are still un-documented (Dana, 2011).

Molecular Characterization

Molecular characterization is the major options for breed definition, especially populations which are not well defined to identify unique alleles. DNA-based methods are independent of environmental factors and provide useful information about genetic diversity to supported the global management of genetic resources (FAO, 2007a; 2011) and genetic conservation (Mendelsohn, 2003). Characterization and conservation of AnGR is important for designing sustainable poverty alleviation (Toro et al., 2006). At molecular level Tadelle, Halima and Dana has been characterized the Ethiopian chickens. Livestock species are sequenced in genome prepares (Burt, 2005) and therefore provides a vast number of microsatellite markers for diversity studies. According to Halima (2007), twenty two microsatellite markers was used based on the degree of polymorphism and genome coverage for the measurement of chicken diversity (Halima, 2007), and application in diversity studies and detailed information in North West Ethiopia. Information is not available on the genetic diversity of Ethiopian local chickens which are important to design effective selection and conservation strategies (Halima, 2007).

Molecular genetic characterization explores polymorphism (magnify and show different form) in selected protein molecules and DNA markers to measure genetic variation at the population level. Because of the low level of polymorphism observed in proteins and hence limited applicability in diversity studies, DNA-level polymorphisms are the markers of choice for molecular genetics characterization. Assessment of Genetic variability at the DNA level, different classes of molecular markers have been employed to study genetic diversity in chickens such as restriction fragment length polymorphisms (RFLP), random amplified polymorphic DNA (RAPD) markers, amplified fragment length polymorphisms (AFLP), mitochondrial DNA (mtDNA) markers, two types of variable number of tandem repeat (VNTR) loci (mini satellites and microsatellites), and more recently single nucleotide polymorphism (SNP) markers Weigend and Romanov (2001), the assessment of DNA marker polymorphism suggests that variability in DNA is a powerful tool for examining diversity within and among individuals, families and populations. In general identification and characterization of animal genetic resources requires information on their population, adaptation to a specific environment, possession of traits of current or future value and socio-cultural importance, which are crucial inputs to decisions on proper utilization and conservation of AnGR (Dana, 2011).

Conservation of Poultry Genetic Resources

Global management of genetic resources at international level is mandatory (Gandini and Oldenbroek, 1999). Communication and information system or Domestic Animal Diversity Information System (DAD-IS) is being developed by FAO and USID during 1952, with the objective of assisting countries by providing extensive searchable databases and guidelines for better characterization, utilization and conservation of chicken genetic resources (Halima, 2007). Such programmes are important because the AnGR have been faced to genetic dilution due to exotic germplasm use, changes in production systems, markets preferences, natural catastrophes, unstable policies from public and private sectors and the availability of very limited funds for conservation activities (Rege and Gibson, 2003; Halima, 2007; Dana, 2011). It should also include the population size of the animal genetic resources, its physical description, adaptations, uses, prevalent breeding systems, population trends, predominant production systems, description of the environment in which it is predominantly found, indications of performance levels (meat, growth, reproduction, egg) and the genetic distinctiveness of the animal (Weigend and Romanov, 2002). This provides a basis for distinguishing among different animal genetic resources and for assessing the available diversity (FAO, 2011).

However, insufficient attention has been given to evaluating these resources or to setting up realistic and optimum breeding goals for their improvement (Dana, 2011). As a result some of the animal genetic resources of Africa are endangered, and unless urgent efforts are taken to characterize and conserve, they may be lost even before they are described and documented and it is also stated that an increasing loss of genetic diversity has been observed and poultry genetic resources are considered to be the most endangered (Crawford, 1990; Halima, 2007). The majority of livestock genetic diversity is found in the developing world where documentation is scarce and risk of extinction is highest and increasing. More particularly, it is estimated that 35 % of mammalian breeds and 63 % of avian breeds are at risk of extinction. These local chickens face genetic erosion which may lead to the loss of valuable genetic variability in specific characteristics of their unique genes and alleles pertinent to their adaptation to particular environments (Romanov et al., 1996). More over characterization, conservation and use of indigenous animal resources under low levels of input in the tropics are usually more productive than is the case with exotic breeds (Halima, 2007).

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Further the rule and strategy of the risk indicators of AnGR guide line established for the next conservation measures of AnGR (FAO, 2007a, 2011). So far status of animal Genetic Resource (AnGR) are classified as critical, critical-maintained, endangered, endangered-maintained, extinct, not at risk and unknown breeds (UNEP, 2008). The important points are relevant to show indicators of the risk of the breeds are described in Table 1. The Table 1 indicator is an important for sustainable management of genetic resources in respect to genetic conservation measures. Cryopreservation is an important complementary measure for the conservation of diversity in poultry as in other farm animal species. Some recent papers summarize the state of the art in long-term storage techniques for avian semen (Blesbois and Labbè, 2003). Over the past 50 years, preservation technologies have been developed for mammalian gametes and embryos, in particular in cattle, which enable to run programs to preserve genetic materials (Gibons et al., 2006).

Table 1 - Classification of AnGR based on their endangerments

Groups of breeds	Total number of breeding		Overall population size	Remark
	Male	Female		
Extinct	0	0	0	There is no breeding male and female
Critical	≤5	≤100	≤120	
Critical-maintained	Active conservation of Critical-maintained			Off side Active conservation programmes
Endangered	5≤20	>100 ≤1000	>1000 or ≤1200	
Endangered-M	Active conservation of Endangered			on side active conservation programmes
Not at risk	More than the required number of breeding males and females			Identified and characterized
Unknown	Unknown			Not identify and characterize

Source: FAO (2007a), UNEP (2008)

Opportunities of Characterization and Conservation of Chicken Genetic Resource

Since 2005, massively parallel DNA primer sequencing has become available and has reduced the cost of DNA sequencing (Shendure and Hailemariam et al., 2008). In the next few years, even more effective sequencing systems will be accessible. This development will open the door for very low cost including the whole genome sequencing. The focus is now moving from the sequencing of a single individual to hundreds or even thousands of individuals. The "1000 genome project" in humans which aims to sequence the genomes of approximately 1200 individuals from 3 major populations at approximately increase 4x coverage that targets 10,000 vertebrate species' Affordable re sequencing will largely extend SNP identification. Analysis of breeds that have not been subject to selective breeding will forward the compilation of bias-free SNP panels for diversity studies. The widespread existence and importance of Copy Number Variation (CNV) on the level of gene expression (Beckman et al., 2007) and of micro RNAs on gene regulation (Shivdasani, 2006) are recent examples of unexpected discoveries. High sequencing in put will be more and more integrated with new statistical approaches (Luikart et al., 2003). We expect that these new tools will stimulate the identification and understanding of variation supporting important traits, including phenotypes relevant for adaptation and sustainable operation. With regard to conservation, whole-genome sequencing will also provide more objective indications of uniqueness than any marker panel (FAO, 2007a). In addition, adaptive variation will be included in prioritization protocols in order to ensure conservation of unique adaptive variants, thus optimizing conservation efforts both in vivo and in vitro. It is also envisaged that breeding and selection will be more and more guided by molecular analysis. Models are to be developed and customized to populations with different genetic structure (small vs. large breeds) and to different purposes (genetic improvement, control of inbreeding, maintenance of diversity.

CONCLUSION

The local chicken genetic resource in Ethiopia is play significant role in poverty alleviation generation additional income and religion or cultural reason. Furthermore some worker tried to phenotypic characterization of local chicken in some parts of Ethiopia such as Tillili Tepi, Medura, Sheka, Horo, Jerso, Farta etc. and only 10 types are recognized and documented in DAD-IS and DAGR-IS. Here in African 60% of wide spread distribution and large population size chicken population are found in Ethiopia. However, this identified small number represented in the databases indicates the shortage of data on chicken genetic resources of Ethiopia suggesting that much of the diversity that exists in the locally adapted populations still remains undocumented. Even if the above limited effort

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and small number of identified ecotype still didn't include chicken genetic resource of all parts of Ethiopia like northern Amhara region of north Gondar administrative zone. The indigenous chicken genetic resource of north Gondar zone needs intensive identification, characterization properly utilization and conservation based on their risk status of extinction. Therefore based on this paper my research is highly initiated to identify and characterize distinct local chicken ecotypes in terms of physical characteristics and production systems of north western part of Ethiopia.

Recommendation

✓As a result, there is a need to design and implement a research programme to collect, conserve and improve the indigenous chickens.

✓Phenotypic characterization should be supported by genetic characterization of animal genetic resource.

✓Lack of documentation, proper utilization and conservation of local Chicken genetic resource is observed.

✓Researchers, developmental workers and policy makers should be give infancies for local genetic resource.

✓Concerned bodies should give mediate response for conservation measure after characterization and describing the risk level of local chicken in Ethiopia.

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Competing Interests

The authors declare that they have no conflict of interest with respect to the research, authorship or publications of this article.

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PREVALENCE OF BOVINE TRYPANOSOMIASIS AND ITS VECTOR DENSITY IN SHEKA ZONE, ANDERACHA WOREDA

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ABSTRACT: A cross sectional study was conducted in Andracha woreda Sheka Zone of South western Ethiopia to determine the prevalence and associated risk factors of bovine trypanosomiasis using parasitological and entomological study. It was conducted from November, 2015 to April, 2016. Blood samples from randomly selected 383 cattle of both sex and different age groups were collected and examined with hematological and parasitological techniques. Out of the total examined cattle, 8(2.1%) were infected with trypanosomes. The highest infections were due to *Trypanosoma conglense* (1.3%) followed by mixed infection (0.52%) and *Trypanosoma brucei* (0.26%). The disease was more prevalent (2.3%) in females than in male cattle (0.2%). There were no statistically significant difference among / between age and sex groups (P>0.05). The mean PCV (%) values during the study period were 23.38 ± 1.51 in parasitaemic and 30.02 ± 0.14 in aparasitaemic animals, which was found statistically significant (P<0.05). *Glossina pallidipes* were the only fly species caught during the study period and the entomological monitoring showed that the apparent density (expressed as flies per trap per day, i.e. f/t/d) of *Glossina Pallidipes* in the study area were 0.83, 0.89, 1.11 and 0.44 at Yokchichi, Gemadro, Beshifa and Shebena, respectively; with the overall apparent density of 0.82. Since it is endemic diseases, strategic control of bovine trypanosomiasis including vector control should be strengthened to improve livestock production in this area.

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INTRODUCTION

Trypanosomiasis is a complex disease caused by unicellular parasites found in the blood and other tissues of vertebrates including livestock, wildlife and people. African animal trypanosomosis (AAT) is found mainly in those regions of Africa where its biological vector (tsetse fly) exists (CFSPH, 2009). Although the occurrence and impact of trypanosomosis depends on tsetse challenge, host distribution, livestock breeds, farming practices and control practices. African animal trypanosomosis causes serious economic losses in livestock through mortality and morbidity of affected animals, reduced productivity, treatment and prevention costs, abandoning arable land etc. (FAO, 2002).

Moreover, the presence of animal trypanosomosis is a major constraint to the introduction of highly productive exotic dairy animals and draught oxen to lowland settlement and resettlement areas for the utilization of large land resources. Since more than 90 percent of crop production in Ethiopia is dependent on animal draught power mainly on ploughing oxen, many large fields lie fallow due to a lack of these animals in trypanosomosis infested area, which worsens the food supply and living conditions in affected areas (Mulaw et al., 2011).

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The risk of infection in humans as well as in domestic animals has greatly affected social, economic and agricultural development of communities within tsetse infested areas which roughly constitutes more than a third (10 million Km square of Africa between 14ºN and 29ºS) of the continent. The 31 species of tsetse flies that invade one-third of Africa through the Trypanosomes they transmit to humans and animals overshadow and darken the public health and agriculture sector in 38 African countries via exposing 160 million cattle to the risk of anemia, emaciation and death .Tsetse flies in Ethiopia are confined to southwestern and northwestern regions between longitude 33⁰ and 38⁰ E and latitude 5 ⁰ and 12 ⁰ N, covering an area of 220000 Km^2 (Dagnachew et al., 2011).

Bovine trypanosomiasis continued to be the major constraints of livestock production in Sub-Saharan Africa, jeopardizing the lives of 55 million people. The most important trypanosome species affecting cattle in Ethiopia are *Trypanosoma congolense, Trypanosoma vivax*, and *Trypanosoma brucei* (Alemayehu et al., 2012). Negative consequence of trypanosomosis on cattle health and production is influenced by Trypanosome species, Trypanosome strain, and age of the infected animal, breed and nutritional status (Tasew et al., 2012). The disease leads to loss of productivity in animals and, without treatment, is frequently fatal. Large areas of land are today left with relatively few cattle because of the presence of the tsetse fly, and the estimated losses in agricultural output and productivity are very significant (FAO, 2002).

The influence of tsetse on African agriculture through the transmission of trypanosomiasis continues to be a major constraint to the development of national economies and their achievement of self-sufficiency in basic food production. The general distribution of tsetse flies is determined principally by climate and influenced by altitude, vegetation, and presence of suitable host animals. Tsetse flies in Ethiopia are confined to southern and western regions between longitude 33⁰ and 38⁰ East and latitude 5⁰ and 12⁰ North which amounts to about 200,000 Km^2. Tsetse infested areas lied in the low lands and also in the river valleys of Blue Nile, Baro Akobo, Didessa, Ghibe and Omo. Out of the nine regions of Ethiopia five (Amhara, Beninshangul Gumuz, Gambella, Oromia and Southern Nation Nationalities and peoples) are infested with more than one species of tsetse flies (Keno, 2005). Although several studies have been carried out so far in different part of the study (Mulaw et al., 2011; Alemayehu et al., 2012; Gebreyohannes and Legesse, 2014; Teka et al., 2012; Lelisa et al., 2015; Takile et al., 2014; Adale and Yasin, 2013) there is still paucity of information in the current study area the study was conducted in the study area. This study was conducted with the following objectives: to assesses the prevalence of bovine Trypanosomosis in the study area and to evaluate the apparent density of bovine Trypanosomosis vectors in the study area.

MATERIAL AND METHOD

Study area

The study was conducted at Sheka zone, Anderacha woreda. Anderacha is one of the woredas in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Part of the Sheka Zone, Anderacha is bordered on the south by Yeki, on the southwest by the Gambela Region, on the northwest by the Oromia Region, on the north by Masha, and on the east by the Keffa Zone. Based on the 2007 Census conducted by the CSA, this woreda has a total population of 23,985, of whom 12,048 are men and 11,937 women. The agricultural activity is mixed farming majorly depends on coffee production (CSA, 2009).

Study population and Study animals

The study animals were local breed cattle (231 males and 160 females) kept under small holder extensive management system in the study area. For ease of analysis and based on their reproductive biology, the sampled animals were categorized into young (1 - 3 years), and adult (>3 years). Body condition scores were estimated as per the recommendations of Nicholson and Butterworth (1986) for evaluating the body condition of zebu cattle. The body condition of animals was recorded by classifying animals in to three groups as good, medium, and poor based on the appearance of ribs and dorsal spines.

Study design

A cross sectional study was conducted at Sheka zone, Anderacha woreda of four randomly selected kebeles to determine the prevalence of trypanosoma infection in cattle and its vector density.

Sample size and sampling method

Systematic random sampling technique was used to select the study subjects from the population in the study area. The sample size was determined based on previously conducted research by Alemayehu et al. (2012) at Chena woreda of 6.9% expected prevalence and absolute desired precision of 5% at 95% confidence level. The desired sample size was calculated using the standard formula described by Thrusfield (2005) and found 99 cattle. However, a total of 383 samples were taken to increase precision.

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Study methodology

Parasitological survey: For parasitological examination a total of 383 blood sample were collected from ear vein of each cattle using microhaematocrit/ capillary tube. During blood collection the necessary bio-data of each animal was recorded. The microhaematocrit / capillary tubes were filled with blood to 2/3 of their length and centrifuged for 3 min at 1500 rpm and examined for trypanosomes by cutting the capillary tube slightly below the Buffy coat to include erythrocytes. The content of the Buffy coat was poured on a slide and covered with cover slip and examined using a microscope. Species identification was done by morphological examination of trypanosomes on Giemsa stained thin blood smears prepared from the positive animals and examined under a microscope using the oil immersion objective (Murray et al., 1988).

Hematological survey: Blood samples for packed cell volume (PCV) were also collected from the selected cattle using heparinized capillary tubes. The packed cell volume (PCV) was measured after centrifugation of the tubes for 5min at 12,000 rpm in microhaematocrit centrifuge and the results were observed using microhaematocrit reader following the standard procedure described by (Murray et al., 1988).

Entomological survey: For the entomological study, tsetse flies were collected by 24 NGU traps deployed in different positions of the study areas of different kebele. Six traps each were deployed at Yokchichi, Gemadro, Beshifa and Shebena kebeles. Traps were deployed in the riverside at approximately 100 m apart for 3 consecutive days. In all the traps Acetone was used as a bait to attract the flies. Fly catch per trap per day (f/t/d) was determined to calculate the fly density and distribution (Leak et al., 1987). Species of the caught flies were identified as described by Uilenberg (1998) and Pollock (1982). Sexing was also done for the flies just by observing the posterior end of the ventral aspect of abdomen by hand lens as a result male flies easily identified by enlarged hypophgeum (Bright et al., 1992).

Data management and analysis

Data collected were entered into Microsoft Excel spread sheet and descriptive statistics was applied to calculate the prevalence of trypanosomiasis using STATA, 2013; window version 13.1. The Percentages (%) were used to measure prevalence and chi-square ($\chi 2$) to measure significance of association among variables considered in this study. In all analysis, confidence level was held at 95% and P < 0.05 was set for significance.

RESULT

Parasitological Findings

From the total of 383 cattle examined with a Buffy coat technique, 8 were Positive for trypanosomes giving an overall prevalence of 2.1%. The prevalence of bovine trypanosomiasis was different among the kebeles, the highest being in Beshifa (4.2%) and the lowest in Shebena (0%), however there was no statistically significant difference (p>0.05). *Trypanosoma congolense*, and *Trypanosoma brucei* were the Trypanosoma species identified by Giemsa stained thin blood smear examination. Among the total of 8 cases of trypanosome infections detected 5(62.5%) of the infections were due to *T. Congolense*, 1(12.5%) were due to *T. brucei* and mixed 2(25%) (Table 1). Sex wise prevalence of trypanosome infection was slightly higher for female (2.3%) than for male (2%) cattle. However, statistically significant difference (P>0.05) was not observed between sexes (Table 2). With respect to body condition score, prevalence was 11.62%, 1% and 0.86% for poor, medium and good body condition score, respectively; which showed statistically significant variation (P<0.05) between them. The prevalence of trypanosomosis from 126 young cattle was 1(0.8%) and from 257 adult cattle was 7(2.72%) with no a statistical significant difference (P>0.05) among age groups (p=0.215).

Hematological finding

The mean PCV (%) values during the study period were 23.38 ± 1.51 in parasitaemic and 30.02 ± 0.14 in aparasitaemic animals. Statistical analysis made to compare mean PCV value of parasitaemic and aparasitaemic animals revealed parasitaemic animals had lower mean PCV than aparasitaemic animals, moreover there was a statistically significant difference (p= 0.000) between the two variables. Cattle having PCV value ≤24 was 8(2.1%) and PCV>24 was 375(97.9%).

Entomological finding

A total of 59 flies were caught in all kebeles. The flies belong to Glossina species and all of them were *Glossina pallidipes*. The overall apparent fly density was 0.82 f/t/d (Table 4). Glossina pallidipes were caught during

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the study period and the entomological monitoring showed that the apparent density of Glossina Pallidipes in the study area were 0.83f/t/d, 0.89f/t/d,1.11f/t/d and 0.44f/t/d at Yokchichi, Gemadro, Beshifa and Shebena respectively with the overall apparent density of 0.82 F/TD.

Table 1 - Species of Trypanosomes and its prevalence in different kebele

Kebele	No. of animals examined	No. (%) positive for *T. congolense*	No. (%) positive for *T. brucei*	Mixed	Overall positive (%)
Yokchichi	96	1(1.04%)	1(1.04%)	0(0%)	2(2.1)
Gemadro	96	1(1.05%)	0(0%)	1(1.04%)	2(2.1)
Beshifa	95	3(3.12%)	0(0%)	1(1.05%)	4(4.2)
Shebena	96	0(0%)	0(0%)	0(0%)	0 (0)
Total	383	5(62.5%)	1(12.5%)	2(25%)	8(2.1)

Table 2 - Prevalence of Trypanosomosis and its associated risk factors

Variable	Categories	No. of animals examined	No. (%) Positive	Prevalence	P value
Sex	Female	174	4 (2.3)	4.139	0.793
	Male	209	4(2)		
Age	Young	126	1(0.8)	1.540	0.215
	Adult	257	7(2.7)		
BSC	Poor	43	5(11.6)	21.552	0.000*
	Medium	224	2(1)		
	Good	116	1(0.86)		
PCV	Anemic	8	7(87.5)	291.449	0.000*
	Non-anemic	375	1(0.26)		

*P < 0.05; = significant

Table 3 - Mean PCV of the examined cattle over aparasitaemic and parasitaemic animals

Over	Mean	Std. Err	(95 % Confidence. Interval)	
Aparasitaemic	30.02	0.138	29.75	30.29
Parasitaemic	23.37	1.511	20.40	26.35

*P =0.05; significant

Table 4 - Distribution, Sex identification and apparent density of G. pallidipes flies trapped from the study area in Anderacha wereda

Study site (kebele)	No of trap deployed	Tsetse fly caught on 3rd day			
		Male	Female	Total	F/T/D
Yokchichi	6	8	7	15	0.83
Gemadro	6	7	9	16	0.89
Beshifa	6	11	9	20	1.11
Shebena	6	3	5	8	0.44
Total	24	29	30	59	0.82

DISCUSSION

The overall prevalence of trypanosomiasis recorded in the present study was 2.1%. This result is lower than study conduct by Alemayehu et al. (2012), Gebreyohannes and Legesse (2014) and Teka et al. (2012) at Chena wereda, in Weliso wereda and selected villages of Arbaminich, respectively. The lower prevalence observed in the current study could be due to previous control method implemented in the study areas for the last years by prophylactic, chemotherapy and insecticide methods. From the 8 trypanosoma infected cattle encountered, 5(62.5%) was positive for *T.conglense,* 1(12.5%) for *T.brucei* and 2(25%) were positive for mixed infection. This

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result approaches to study conducted by Lelisa et al. (2014) in Hawa–Gelan district. The presence of relatively higher infection by *T. congolense* probably suggests that transmission of trypanosomes in the study area is more of biological than mechanical.

Although the prevalence of Trypanosomosis was relatively higher in female cattle than males there was no significant difference between sexes groups (P > 0.05). This finding is consistence with Lelisa et al. (2015), Takile et al. (2014), Adale and Yasin (2013) and Mulaw et al. (2011) who did similar investigation at Mandura District Northwest Ethiopia, Guto Gida District of East Wollega Zone, Wolaita Zone Kindo Koish District and Assosa, respectively. The result did not agree with study done by Teka et al. (2012), in selected villages of Arbaminch and Gemeda (2015) in and around Nekemte Areas, East Wollega Zone. The high prevalence in females may be related to their milk production and pregnancy makes them stressed and result in susceptible to the infection.

The prevalence of trypanosomosis from 126 young cattle was 1(0.8%) and from 257 adult cattle it was 7(2.72%); with no statistical significant difference (P>0.05) among age groups (P=0.215). This result agrees with study conducted by Alemayehu et al. (2012) in Chena Wereda, and Bishaw et al. (2012) at Wembera district of West Gojam. This result is different from study conducted by Dagnachew and Shibeshi (2011) anger valley of East Wollega Zone and Teka et al. (2012), at selected areas of Arbaminich. This may be due to the fact that most of the young animals in the study area were confined to house and they don't have access to grazing lands where the vectors usually prevail. However, the observed difference in the prevalence of trypanosomosis between the age groups could be associated partly to the non-proportional sampling and sample size. The disease was found with the highest prevalence in poor body condition (11.62%) followed by in medium (1%) and good body condition (0.86%). This finding was consistent with the study conducted by Habte et al. (2015) at Darimu District, Ilu Aba Bora Zone, Western Ethiopia, Lelisa et al. (2014) in three selected settlement areas of Hawa-Gelan district, western Ethiopia, Feyisa et al. (2015) in Didesa District of Oromia Regional state and Gebreyohannes and Legesse (2014) at Wolliso Wereda. It may be related with the disease itself causes progressive emaciation of the infected animals. In the other scenario, animals with good body condition have well developed immune status that can respond to any infection than those non–infected cattle with poor body condition

The mean PCV (%) values during the study period were 23.38 ± 1.51 in parasitaemic and 30.024 ± 0.14 in aparasitaemic animals. This result agrees with study conducted by Feyisa et al. (2015) at Didesa District of Oromia Regional State and Dagnachew and Shibeshi (2011) at anger valley of East Wollega Zone. The interplay of several factors acting either individually or synergistically contributes to the development of haemolytic anaemia in human and animal trypanosomosis. Most common among these factors are erythrocyte injury caused by lashing action of trypanosome flagella, undulating pyrexia, platelet aggregation, toxins and metabolites from trypanosomes, lipid peroxidation and malnutrition. Meanwhile, idiopathic serum and tumor necrosis factors are responsible for dyserythropoieses (Mbaya et al., 2012). Comparable overall apparent density of flies (1.4) has been recently reported by Shiferaw et al. (2016). The lower overall apparent fly density may be attributed to the season of the year during which the traps were deployed. However, recording these much apparent densities of Glossina Pallidipes during the dry season of the year can potentially pose huge influence on the disease transmission.

CONCLUSION AND RECOMMENDATION

The present study showed a relatively low prevalence of trypanosomiasis 2.1% and apparent density of tsetse flies 0.82 f/t/d in Anderacha wereda. However, this is an evidence not to be neglected that tsetse and trypanosomosis has yet continued to pose a considerable threat to cattle of the study area warranting an integrated parasite and vector control to safeguard cattle production and productivity. In this study *T. conglense* (62. 5%), *T. brucei* (12.5%) and mixed infection (25%) are trypanosome species identified and on entomological survey, only one species of tsetse fly identified was *G. pallidipes.* Higher prevalence of trypanosomosis infection was observed in animals with poor body condition and low PCV animals. From the total risk factors PCV and body condition are found significant. Based on the above conclusion, the following recommendation are forwarded

- Strategic control of bovine trypanosomosis including vector control should be strengthened to improve livestock production.
- Further surveys and studies should be conducted and appropriate, feasible control of trypanosomosis must be done.

Author's contribution

B Yigzaw performed the data collection, laboratory works and write up of the manuscript. T Asmare analyzed the data and S Derso revised the manuscript for important intellectual contents. All authors read and approved the final manuscript.

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Conflict of interests
The authors have declared that no competing interests exist.

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STOMACH ADAPTATIONS OF BROILERS FED *Acacia angustissima* LEAF MEAL BASED DIETS

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ABSTRACT: The study determined effect of *Acacia angustissima* leaf meal on the stomach physiology of broilers. 150 day old chicks were randomly allocated to 0%, 5% and 10% *A. angustissima* leaf meal based diets for six weeks with five replicates per treatment. At weeks 2, 4 and 6, two birds from each replicate were slaughtered, dressed and weighed. The weights of the proventriculus and gizzard were measured. Approximately 1 cm specimen was taken from each organ, fixed in formalin and stained for histological analysis using a light microscopy. Proventriculus muscle layer thickness, gland diameter and secretory layer thickness decreased with increasing leaf meal levels (P<0.05). *A. angustissima* leaf meal had no effect on the physiology of the gizzard during the starter phase (P>0.05). Continued use of the of *A. angustissima* leaf meal in the grower and finisher diets resulted in increased weight and muscle thickness of the gizzard (P<0.05). It was concluded that *A. angustissima* leaf meal reduced the physiological capacity of the proventriculus to secrete digestive juices and enhanced the physiological capacity of the gizzard for mechanical digestion.

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INTRODUCTION

The increased demand of poultry meat has directed breeding focus towards a fast growing broiler with increased feed efficiency and greater final weights (Olanrewaju et al., 2006; Petracci and Cavani, 2012). To support the fast growth in broilers, soybean and maize have been the most conventionally used protein and energy sources (Ochetim, 1993; Onuh et al., 2010). However the increasing cost and scarcity of these conventional ingredients has been reported to affect broiler production in most developing countries (Rao et al., 2005; Khattak et al., 2006; Anaeto and Adighibe, 2011; Gadzirayi et al., 2012; Diara and Devi, 2015), prompting use of alternative ingredients.

In line with this drive, Ncube et al. (2012ab) assessed the potential of *A. angustissima* leaves as a broiler protein ingredient. Based on their findings, inclusion of *A. angustissima* at 5-10% in diets can support growth of broiler. However, findings also show that inclusion of 5 to 10 % of the leaf meal can result in 14.28 to 17.86 % increase in the weight of the gizzard (Ncube et al., 2012c), possibly implying some physiological changes on the organ. It's important to check if increase in size of the gizzard is of a pathological nature or simple adaptations to leaf meal presence. It was the objective of this study to determine effect of graded levels of *A. angustissima* leaf meal based diets on the physiology of the proventriculus and gizzard.

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MATERIALS AND METHOD

A. angustissima leaves were harvested at mid-maturity stage of growth, air dried and ground through a 1mm sieve. Dry matter, crude protein, crude fiber, ash (AOAC, 1990), condensed tannins (Porter et al., 1986), soluble and insoluble fibres (Parsaie et al., 2006) were determined (Table 1). Three iso-nitrogenous and iso-energetic diets were formulated for a three phase feeding programme at 0%, 5% and 10% leaf meal inclusion (Table 2). One hundred and fifty day old unsexed Cobb 500 broiler chicks were randomly allocated to 15 groups with 10 birds per group. The groups were randomly allocated to the three diets in five replicates. The starter, grower and finisher diets were fed from week 1 to 2, week 3 to 4 and week 5 to 6 respectively. Feed and water were provided *ad libitum* throughout the trial.

At weeks 2, 4 and 6, ten birds per treatment were slaughtered and dressed. The proventriculus and gizzard were removed and weighed. The weight of the organs was expressed as proportions of hot dressed weight. For purposes of histopathology, approximately, 1 cm of the proventriculus and gizzard were cut and fixed in 10% saline formalin. The fixed fragments were stained on slides (Bacha and Bacha, 2000).

Using a Leitz MD5 light microscope fitted with an eye piece graticle, ten points of the following parameters were measured and averaged into one value per bird. The proventriculus muscle thickness, secretory layer thickness and diameter, the thickness of the gizzard muscle, gizzard glandular and keratin layer were measured at x4 objective. The number and size of muscle fibers of the gizzard were counted and measured across a 0.2 mm length at x40 objective. All procedures in this experiment followed guidelines by the Zimbabwe Scientific Animal Act, 1963, subsection 2 of section 4, License Number L624. To determine effect of diet on the physiology of the organs, ANOVA was carried out using PROC GLM procedure of SAS version 9.3. Comparison of means was done using Tukey's test.

Table 1 - Chemical composition of *A. angustissima* leaf meal

Chemical Component	Percentage (%)
Dry matter	90.00
Ash	4.77
Crude protein	23.40
Crude fibre	13.00
Calcium	0.94
Phosphorus	0.17
Condensed tannins	1.06
Insoluble Dietary Fibre	9.24
Soluble Dietary Fibre	4.96

Table 2 - Ingredient and chemical composition of diets

Ingredient(kg)	Starter Diets			Grower Diets			Finisher Diets		
	Control	Diet 1	Diet 2	Control	Diet 1	Diet 2	Control	Diet 1	Diet 2
Soya Meal	30.00	25.00	20.00	18.7	13.70	8.70	18.60	13.60	8.60
Meat and Bone Meal	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sorghum meal	10.00	0.00	10.00	0.00	9.90	10.00	0.00	0.00	0.00
Acacia leaf meal	0.00	5.00	10.00	0.00	5.00	10.00	0.00	5.00	10.00
Blood meal	0.00	0.00	0.00	0.00	2.00	3.00	1.20	1.80	3.00
Sunflower cake	2.50	1.30	0.00	1.70	1.50	2.1.0	0.00	0.00	0.00
L. Threonine	0.06	0.06	0.03	0.05	0.00	0.45	0.00	0.00	0.00
Soya oil	0.00	0.00	0.00	0.00	1.60	3.00	0.00	1.30	2.40
Wheat bran	0.00	0.00	2.10	0.00	0.00	0.00	0.00	0.00	0.00
Soya oil	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Maize meal	48.60	56.90	44.00	68.1	55.00	51.40	73.00	70.40	67.50
Fish meal	1.20	4.90	5.00	4.6	4.60	5.00	0.10	1.00	2.00
DL Methionine	0.30	0.29	0.79	0.19	0.16	0.11	0.15	0.15	0.07
Lysine HCL	0.26	0.22	0.28	0.21	0.14	0.12	0.00	0.00	0.00
Monocalcium phosphate	0.50	0.30	0.30	0.2	0.30	0.30	0.16	0.15	0.07
limestone	0.88	0.43	0.40	0.65	0.50	0.27	0.74	0.55	0.36
Salt	0.40	0.30	0.30	0.3	0.30	0.25	0.35	0.35	0.30
Broiler Premix[123]	0.30	0.30	0.30	0.3	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100	100	100	100	100
Chemical composition									
Crude protein (g/kg)	226.00	226.13	225.28	199.90	199.74	200.12	175.00	174.94	174.93
ME (MJ/kg)	12.50	12.46	12.39	13.09	13.07	13.08	13.20	13.21	13.18
EE (g/kg)	36.80	39.04	51.94	41.64	55.17	67.71	39.19	51.27	61.45
CF (g/kg)	41.50	40.15	49.98	34.38	39.88	46.84	31.90	37.88	43.86
Ca (g/kg)	9.98	9.52	9.88	9.22	5.59	5.60	4.93	8.63	8.74
P (g/kg)	7.08	7.10	7.04	6.53	6.61	6.58	6.00	6.02	6.08
Condensed tannins (%)	0.004	0.059	0.076	0.0036	0.056	0.083	0.0043	0.055	0.077

[1]Composition: 9.9u.i vitamin A, 1.95u.i vitamin D_3, 30u.i vitamin E, 2.9g Vitamin K3, 2g Vitamin B1, 7.5g Vitamin B2, 30g Vitamin PP Niacin, 12.1g Vitamin B5, 3g Vitamin B6, 1g vitamin B9 Folic Acid, 150mg Vitamin B7/Biotin, 20mg Vitamin B12, 300g Choline, 60g Iron, 10g Copper, 100g Manganese, 100g Zinc, 1g, Iodine , 0.5g Cobalt, 300mg Selenium. [2]Composition: 8u.i vitamin A, 2u.i vitamin D, 25u.i vitamin E, 2g Vitamin K3, 1.75g Vitamin B1, 6g Vitamin B2, 25g Vitamin PP Niacin, 10g Vitamin B5, 2g Vitamin B6, 1g vitamin B9 Folic Acid, 100mg Vitamin B7/Biotin, 15mg Vitamin B12, 250g Choline, 50g Iron, 8g Copper, 80g Manganese, 80g Zinc, 1g, Iodine , 0.5g Cobalt, 250mg Selenium. [3]Composition: 6u.i vitamin A, 1.5u.i vitamin D_3, 20u.i vitamin E, 1.5g Vitamin K3, 1.5g Vitamin B1, 5g Vitamin B2, 25g Vitamin PP Niacin, 8g Vitamin B5, 1.5g Vitamin B6, 0.6g vitamin B9 Folic Acid, 80mg Vitamin B7/Biotin, 15mg Vitamin B12, 200g Choline, 40g Iron, 6g Copper, 80g Manganese, 60g Zinc, 1g, Iodine , 0.25g Cobalt, 200mg Selenium

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Table 3 - Physiological response of proventriculus parameters to graded levels of *A. angustissima* leaf meal

Parameter	Control	5 % AA	10 % AA	SE
Proventriculus weight (%)	0.846	0.855	0.855	0.0341
Proventriculus muscle (mm)	0.221[a]	0.213[a]	0.169[b]	0.0065
Proventriculus gland diameter (mm)	1.267[a]	1.180[b]	1.094[c]	0.0237
Secretory cell layer thickness (mm)	0.605[a]	0.571[ab]	0.556[b]	0.0135

[abc] Within a row, means without a common superscript differ (*P*<0.05), AA= *Acacia angustissima*
SE= Standard error

Table 4 - Effect of graded levels of *A. angustissima* leaf meal on physiological parameters of the gizzard

Age(Wk)	Gizzard weight (%)			Gizzard muscle thickness(mm)			Keratin Layer(mm)			Myofibril (mm)			Number of Fibers		
	0 % AA	5 % AA	10 % AA	0 % AA	5 % AA	10 % AA	0% AA	5 % AA	10 % AA	0 % AA	5 % AA	10 % AA	0% AA	5 % AA	10 % AA
2	4.420	4.610	4.580	2.880	3.199	3.290	0.269	0.328	0.430	0.064	0.065	0.068	3.194	3.340	3.034
4	2.601[a]	3.472[b]	4.051[b]	3.052[a]	5.098[b]	5.797[b]	0.416[a]	0.577[a]	0.783[b]	0.071[a]	0.121[b]	0.135[c]	3.023[a]	2.013[b]	1.541[b]
6	2.040[a]	2.393[a]	3.062[b]	5.005[a]	8.430[b]	10.095[b]	1.006[a]	0.753[b]	0.346[c]	0.078[a]	0.121[b]	0.141[c]	2.586[a]	1.675[b]	1.485[b]
SE	0.210	0.210	0.210	0.418	0.418	0.418	0.044	0.044	0.044	0.006	0.006	0.006	0.179	0.179	0.179

[abc] Within a row means for a parameter without a common superscript differ (P<0.05), Wk=Week, AA= *Acacia angustissima*, SE= Standard error

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RESULTS

A. angustissima had no effect on proportionate weight of the proventriculus but proventriculus muscle layer thickness, gland diameter and secretory layer thickness decreased with increasing leaf meal levels (P<0.05; Table 3).

The proportionate weight of the gizzard, thickness of gizzard muscle, keratin layer, myofibril thickness and number of myofibrils per unit length was influenced by age of birds. The proportionate weight of the gizzard, thickness of the gizzard muscle layer, keratin layer, fiber muscle and number of fibers (Table 4) was the same across treatments at week two (P>0.05). By week four, an increase in the proportionate weight of the gizzard, thickness of muscle layer, keratin layer, muscle fiber and a decrease in the fiber numbers was noted with increasing level of the leaf meal (P<0.05). By the end of the week 6 the proportionate weight of the gizzard, gizzard muscle thickness, muscle fiber thickness increased with increasing levels of the leaf meal while the keratin layer thickness and number of myofibrils decreased with increasing levels of the leaf meal (P<0.05).

An increase in the level of the leaf meal resulted in significant increases of the gizzard glandular layer thicknesses from 0.731 ± 0.032 mm of the control to 0.842 ± 0.032 mm and 0.762 ± 0.032 mm of the 5% and 10% fed birds respectively (P<0.05; Table 4). Glandular layer for birds on the 5% fed bird increased by 15.18% while those on the 10% diet increased by 4.24%. Gizzard from birds on the 5% diet had the thickest glandular layer, which was not different from the birds on the 10% diet (P>0.05).

DISCUSSION

Reduced muscle layer, gland diameter and thickness of secretory cell layers of the proventriculus at 10% inclusion of the leaf meal could be indicative of reduced capacity to secrete mucus, hydrochloric acid, and pepsinogen in the presence of the leaf meal. As gastrointestinal mass reduces, so does the functional capacity of organs (Starck, 1998). This is usually regulated by presence of food molecules in the organ (Eckert et al., 1988). Presence of the leaf meal, a fibrous ingredient, can reduce feed intake as it can make the diets bulkier.

The increase in proportionate weight and muscle layer thickness of the gizzard with increasing levels of the leaf meal depicts enhanced mechanical digestion by the organ. The need by the gizzard to meet the demand for greater grinding of increased dietary fiber quantities explain the increase in the proportionate weight and muscle layer of the gizzard. Fiber particles are generally harder to grind than other dietary components (Mateos et al., 2012), thus presence has been noted to promote thickening of the gizzard muscle layer (Banfield and Forbes, 2001; Sobayo et al., 2012; Adeyemi et al., 2013) as is also recorded in this study. Similarly to current results, Incharoen (2013) reported increased proportionate weight of the gizzard of broilers fed rice hull based diets and attributed the increase in weight to presence of fibers. Kagya-Agyemang et al. (2007), Borin (2012), Jiang et al. (2012) and Adeyemi et al. (2013) also reported increased proportionate weight of the gizzard on inclusion of *G. sepium*, cassava, Alfalfa and cassava leaf meals respectively. Since the major function of the gizzard is to mechanically break down feed particles through muscle contractions (Sobayo et al., 2012; Adeyemi et al., 2013; Svihus, 2014), the increased proportion of the gizzard relative to body weights is a physiological adaptation to increasing levels of the *A. angustissima* leaf meal.

The increase in the proportionate weight of the gizzard in this study was through thickening of the muscle layer, an indication of increased muscle activity with addition of the leaf meal. According to Akester (1986), Svihus (2011) and Svihus (2014), when the contractile activity of the gizzard increases, the gizzard wall becomes thicker as the organ attempts to increase its digestive efficiency (Waugh et al., 2007). Obun et al. (2008) also says that the development of the gizzard muscle is triggered by the work load imposed on the organ. According to Borin (2012) even minimum increases in crude fiber can stimulate gizzard development. Therefore presence of *A. angustissima* in the diet stimulated gizzard function, resulting in the expressive muscle development observed as thickening of the muscle fiber with increasing levels of the leaf meal in the diet. The increase in the thickness of the gizzard muscle layer was through hypertrophy as seen by the increase in myofibril thickness with an associated decline in muscle numbers. The stimulus to such hypertrophic responses is the contractile activity of the gizzard as the mechanical load on the organ increased (Vaughan and Goldspink, 1979). Such a response would result in an increase in the amount of contractile muscle without an increase in the number of muscle fibers (Paul and Rosenthal, 2002) and is attributed to the increase in the bulkiness of digesta (Starck and Rahmaan, 2003).

The non-significant effect of treatment on all gizzard parameters at the starter phase indicates the ability of all the diets to supply nutrients that could support growth during that growth phase. This could be due the presence of the highly nutritious yolk sac, coupled with the still low nutritional demands by the chicks and the still developing gastrointestinal tract capacity (Nay and Sklan, 2002; Maiorka et al., 2006; Panda et al., 2006). With the residual yolk providing digestible nutrients that are responsible for the development of the GIT (Dibner and Richards, 2004)

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not a lot of grinding is expected from the still developing gizzard. The results indicated that early development of gastro intestinal tract was independent of presence of *A. angustissima* leaf meal in starter diets. The gizzard must also go through a period of development (Maiorka et al., 2006) and can only adapt to fibrous diets when it is fully functionally developed (Nkukwana et al., 2015). As the birds grew older, the increase in nutritional demands can help explain the need for increased gizzard functional capacity.

CONCLUSION

The study concludes that increasing levels of *A. angustissima* leaf meal in broiler diet decreases the proventriculus muscle thickness, proventriculus gland diameter and the secretory layer thickness of the proventriculus. Effect on the gizzard was depended on the age of the broilers. Inclusion of *A. angustissima* in broiler starter diets had no effect on the physiology of the gizzard. In the grower and finisher phases of feeding, increasing levels of *A. angustissima* resulted in increased weight of the gizzard through an increase in muscle layer. The increase in the thickness of the muscle layer was through a hypertrophic response of muscle fibres to presence of *A. angustissima* leaf meal. Therefore inclusion of *A. angustissima* leaf meal in broiler diets reduced physiological capacity of the proventriculus to secrete digestive juices and enhanced physiological capacity of the gizzard for mechanical digestion

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Author's contribution

All authors contributed equally to this work.

Competing interests

The authors declare that they have no competing interests.

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SMALL RUMINANT GIT PARASITES IN ENEMAY DISTRICT, ETHIOPIA: PREVALENCE AND RISK FACTORS

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ABSTRACT: A cross sectional study was conducted to determine the prevalence and risk factors associated with small ruminants GIT helminthes parasites in Enemay district, East Gojjam, Northwest of Ethiopia from October, 2013 to April, 2014 based on coprological examination. A total of 384 small ruminants' faecal samples (248 sheep and 136 goats) were collected and examined using standard parasitological procedures of sedimentation and flotation techniques. The present study revealed that the overall prevalence of the major gastrointestinal tract (GIT) helminthes parasite was 229 (59.63%). Out of 229 positive samples the species of parasites were found *Strongyle* (22.9%), *Fasciola* (14.1%), *Paramphistomum* (7.03%), *Monesia* (5.73%) and as mixed infection (9.9%). *Strongyles* were the most prevalent parasites encountered in the area followed by *Fasciola*. The study showed that 63.7% and 52.2 % of sheep and goats, respectively were infected with one or more helminthes and higher prevalence was observed in sheep than goats and there was statically significant (P<0.05) between them. Female animals were found with higher prevalence of helminthes infection rate than male animals with a prevalence of 59.9% and 40.1%, respectively and there was statically significant (P<0.05) between sex. Higher prevalence was observed in young animal than adult animal in this study and the prevalence was 67.9% and 53.6%, respectively. There was statically significant (P<0.05) between age group. The study showed that higher prevalence of helminthic infection was observed in poor body condition animals as compared to medium and good body condition animals and their prevalence were 89.9%, 59% and 44% respectively. There was highly statically significant (P<0.0001) between body condition of the animal. In Conclusion the animal was affected by different helminthes parasites infections which cause loss of production, reducing growth rate and death of small ruminants. The animal owner should be deworming their small ruminants by different anthelmintics based on order of the Veterinarian to avoid drug resistance as recommendation.

Keywords: GIT helminthes, Prevalence, Small ruminants, Enemay district, Ethiopia

INTRODUCTION

The livestock sector is a massive transformational state to meet increased demand of animal origin foods for increasing human population (Karim et al., 2008). Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter supply etc provide the needed animal proteins that contribute to the improvement of the nutritional status of the people. Livestock also plays an important role in providing export commodities, such as live animals, hides, and skins to earn foreign exchanges to the country. Ethiopia has an estimated of 53.4 million Cattle, 25.5 million sheep, 22.78 million goats, 2 million horses, 6.2 million donkeys, 0.38 million mules, about 1.1 million camels and 49.3 million poultries (CSA, 2011).

Sheep and goat production play an important role in the livelihood security and economic sustenance of poor farmers in semiarid, arid, hilly and mountainous regions of the world. These animals survived under low input

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system depending mostly on seasonal grasses, and crop straw (Karim et al., 2005). Sheep and goats are widely adapted to different climates and are found in all production system. They also have lower feed requirement as compared to cattle because of their small body size. This allows easy integration of small ruminants in to different farming system (Alemu and Markel, 2008). Parasitic helminthes or worms are important cause of disease in all species of animal. Although in many case they produce little serious damage to the host, these parasites are never beneficial in some case they can produce sever and even fatal disease (Jones et al., 1996).

Helminthes infections, or helminthosis, thus refer to a complex of conditions caused by parasites of the Nematoda, Cestoda and Trematoda. Although all grazing sheep and goats may be infected with the above-mentioned parasites, low worm burdens usually have little impact on animal health. But as the worm numbers increase, effects in the form of reduced weight gain and decreased appetite occur. With heavier worm burdens clinical signs such as weight loss, diarrhoea, anaemia, or sub-mandibular oedema (bottle jaw) may develop (Sissay, 2007).

The gastro intestinal tract may be inhibited by many species of parasites. Their cycle maybe direct which eggs and larvae are passed in the feces and stadial development occurs in to the infective stage, which then ingested by the final host. Alternatively the immature stage may be ingested by an intermediate host(usually invertebrate) in which further development occurs and an infection is acquired when the intermediates or free living stages shed by the host is ingested by final host. In host, resistance, age, nutrition and contaminant disease also influence the course of parasitic infection. The economic importance of subclinical parasitism in farm animal is also determined by the above factors, and it is well established that highly parasitized animal that show no clinical sing of the disease perform less efficiently in the feedlot, dairy or finishing (Kahn et al., 2005).

Gastrointestinal parasites infections are a world-wide problem for both small and large scale farmers, but their impact is greater in sub-Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species. Economic losses are caused by gastrointestinal parasites in a variety of ways: they cause losses through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake, lower weight gains, lower milk production, treatment costs, and mortality in heavily parasitized animals (Fikru et al., 2006*).* In Ethiopia, 5-7 million sheep and goats die each year due to diseases including helminthes infections. More significant, however, are losses resulting from inferior weight gains, condemnation of organs and carcasses and lower milk yields. The overall economic loss to the Ethiopian meat industry due to parasitic diseases is estimated at US$ 400 million annually (MOARD, 2007).

Sheep and goats harbor a variety of gastrointestinal tract (GIT) parasites, many of which are shared by both species. Among these parasites, helminthes are the most important GIT parasites that affect the growth as well as production of the animals. Gastrointestinal nematodes of *Trichostrongylidae* family are perhaps the most important parasites of small ruminants worldwide, causing significant morbidity and loss of production. Helminthic infections can be treated by anthelmintic, however, treatment is costly and drug resistance has evolved in all major parasite species (Ijaz et al., 2009).

Parasitic infection ranges from acute disease frequently with high rates of mortality, chronic disease, resulting in various degrees of morbidity and premature culling to sub clinical infection with sheep appearing relatively healthy but frequently performing below their full potential. The parasitic helminthes of small ruminant can be sub divided in to nematodes (round worm), trematode (flukes), and cestodes (tapeworms) (Aitken, 2007). It is impossible to give an accurate estimate of the economic importance of parasite diseases because it varies so greatly between countries and between region, depending both on climate and on the intensive farming in the area (Radostits et al., 1993). In the varied agro-climatic zones of Ethiopia, small ruminants are important source of income for rural communities and are one of the nation's major sources of foreign currency from exports. In Ethiopia about 8 millions of small ruminants are slaughtered annually and providing more than 30% of domestic meat consumption. The rich potential from the small ruminant sector is not efficiently exploited; however, due to several constraints, including malnutrition, inefficient management and diseases (Abebe and Esayas, 2001).

Enemay district has 71432 small ruminants, of which 61233 sheep and 10199 goats which are managed under extensive management system. The sheep and goats provide cash income, meat and skinto the Enemay district society and to different hotels in Bichena town. The animal mostly affected by different disease due to suitability of the district to different disease epidemiology including helmintic infection and their productivity is low. But there is no enough information about the prevalence of major GIT helminth parasites of small ruminants in the district. Therefore the objectives of this study in the study area were to determine the prevalence of gastrointestinal parasite of small ruminants in the study area and to assess the major risk factors associated with prevalence of GIT parasites of small ruminants.

MATERIAL AND METHODS

Study area

The study was conducted from October, 2013 to April, 2014 at Enemay district which is found in East Gojjam administration zone, in Amhara region at 265km in Northwest of Addis Ababa. The mean annual temperature of the district is 21°c and annual rain fall is 815-1440 mm. It lies at10°27′North 38°12′Eastlatitude and longitude respectively and 2572 meter above sea level. Enemay district has 108224 of livestock population of which 71432 small ruminants that managed under extensive management system. The animal used as cash income, draught power, and as food source in the form of meat, milk and egg (EWARDO, 2012).

Study animals

The study animals were small ruminants (sheep and goats) in Enemay district which are managed under extensive management system. These animals are maintained in small households flocks of mixed age group and sex. The number of goat is decrease as increase altitude while the number sheep increase. All the sheep and goats that the sample collected was indigenous breed and the animal was classified as young (≤1 year) and adult (>1 year) according to (Berisa et al., 2011) and age was estimated based own owners knowledge and pattern of incisor eruption (MOARD, 2009) and body condition can be classified as poor, medium and good according to (Asmare et al., 2012) and body condition Scoring is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Thompson and Meyer, 1994).

Sample size determination

The sample size required for this study was determined based on sample determination in random sampling with expected prevalence of major gastro intestinal helminthes of small ruminant in the study area is 50% which no previous know prevalence and at 5% desire absolute precision and 95% confidence level according to Thursfield, (2005). Therefore, the sample size of 384 small ruminants (248 sheep and 136 goats) was obtained by using formula for sample size determination as given below as follow.

$$n = \frac{1.96^2 Pexp\,(1-Pexp)}{d^2}$$

Where:

n = required sample size,

Pexp= expected prevalence = 50%

d= desired absolute precision = 5%

Study design

The study design was cross-sectional which carried out to determine the prevalence of major GIT helminthes parasites of small ruminants and to assess associated risk factor based on coprological examination.

Sample collection and coprological examination

The sample was collected from 384 small ruminants (248 sheep and 136 goats) directly from the rectum which is placed on sample container bottle with 10% formalin as preservative. During sample collection, date, sex, species of animal, age, and body condition of the animal were properly recoded. After collecting the sample was examined by flotation and sedimentation technique at Enemay district Veterinary clinic with a standard parasitological procedure described by (Hansen and Perry, 1994). Eggs of the different helminthes were identified on the basis of morphological appearance and size with the help of keys (Urquhart et al., 1996).

Data entry and analysis

All collected data were entered to Micro- Soft Excels sheet version 2007 and analyzed by SPSS version 20. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test was used to assess the association of the potential risk factors with the prevalence of the parasites. For statistical analysis a confidence level of 95% and P-values less than 5% ($P<0.05$) was considered as significant.

RESULTS

Out of the total 384 (248 sheep and136 goats) small ruminants examined over the study period, 229 (59.63%) were found to harbor one or more parasite species. Out of the total of 248 (63.7%) of the sheep and136 (52.2%) of the goats studied were found to harbor one or more parasite species. There was statically significant between the two species (χ^2=4.829, and $P<0.05$; Table 1). The prevalence of major GIT helminthes parasite in

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relation to sex, 59.9% in female and 40.15 in male were observed. Higher prevalence was recorded in female (59.9%) than in male (40.1%) and there was statically significant between sex (χ^2=9.77, and P<0.05; Table 2). The prevalence of major GIT helminthes parasite in different age group were 67.9% in young and 53.6% in adult sheep and goat and there was statically significant between age (χ^2=7.954,and P<0.05; Table 3).

Higher prevalence was observed in poor body condition (89.9%) as compared to medium (59.7%) and good (44%) body condition. There was also highly statically significant between body condition (χ^2=39.734, and P<0.000 (Table 4). The distribution of different classes of helminthes parasites of small ruminant in the study area were nematodes (*Strontyle* type) followed by trematodes (*Fasciola* and *Paramphistomum*) and cestodes (*Monesia*) in both host species. The overall prevalence of the parasite based on specie of parasite was 22.92% *Strongyle,* 14.1% *Fasciola,* 7.03% *Paramphistomum,* and 5.73% *Monesia.* The infection of helmenthiasis which include more than one types of parasite was found in 9.9% of the examined animals. Of this the infection of *Fasciola* and *Paramphistomum* were the highest concurrent infection followed by *Fasciola* and *Strongyle* species (Table 5).

Table 1 - Prevalence of major GIT helminthes parasite based on species small ruminant

Species	No. examined	No. positive	Prevalence (%)	χ2	P-value
Sheep	248	158	63.7	4.829	0.028
Sheep	136	71	52.2		
Total	384	229	59.6		

*P < 0.05; = significant

Table 2 - Prevalence of major GIT helminthes parasite based on sex of the animal

Sex	No. examined	No. positive	Prevalence (%)	χ2	P-value
Female	230	152	59.91	9.77	0.0002
Male	154	77	40.1		
Total	384	229	59.63		

*P < 0.05; = significant

Table 3 - Prevalence of major GIT helminthes parasite based on age

Age	No. examined	No. positive	Prevalence (%)	χ2	P-value
Young	162	110	67.9	7.954	0.005
Adult	222	119	53.6		
Total	384	229	59.63		

*P < 0.05; = significant

Table 4 - Prevalence of major GIT helminthes parasite based on body condition

Body condition	No. examined	No. positive	Prevalence (%)	χ2	P-value
Poor	69	62	89.9	39.734	0.000
Medium	181	108	59		
Good	134	59	44		
Total	384	229	59.63		

*P < 0.05; = significant

Table 5 - Prevalence of major GIT helminthes parasite based on species of animal and parasite

Species	No.positive	Strongyle (%)	Fasciola (%)	Paramphistomum (%)	Monesia (%)
Sheep	158	61(38.61)	38(24.1)	20 (12.7)	17(10.8)
Goat	71	27(38.03)	16(22.53)	7(9.86)	5(7.04)
Total	229	88(38.42)	54(23.5)	27(11.8)	22(9.6)

*P < 0.05; = significant

DISCUSSION

The present study revealed that the overall prevalence of GIT helminth parasites was 59.63% in the small ruminants examined. This finding is comparable with the finding of (Tesfaheywet, 2012) reported 61.4%, in Haremaya, South Eastern Ethiopia and lowered than the results of other studies in sheep and goat carried out in different part of Ethiopia (Bersissa et al., 2011) 70.2% in Central Oremia, (Nuraddis et al., 2014) 87.2% around Jimma town, Western Ethiopia, (Bikila et al., 2013) 87.3% in Gechi District, Southwest Ethiopia and elsewhere in the world (Pant et al., 2009) 96.0% in Tarai region of Uttarakhand, and (Kuchai et al., 2011) 69.7% in Ladakh, India. The current lower prevalence finding might be due to now a day the animal owner manages their animal properly by regular deworming by different anthelmintics during different season of the year, proper feeding of their animal that helps the animal to protect themselves from different helminthes infection by developing rapid immune response to the parasite. Different parasites require different agro climate for multiplication and survival of the infective stage of the parasite and infect the animal and this area might be do not allow this things for the parasite. The present study showed that 63.7% and 52.2 % of sheep and goats respectively are infected with one or more helminthes and higher prevalence was observed in sheep than goats which is agreed with other studies that reported higher prevalence in sheep than goats (Bikila et al., 2013) which is 90.2% and 82.6% in Gechi District, Southwest Ethiopia, (Welemehret et al., 2012) 56.25% and 35.33% in and around Mekelle Town, Northern Ethiopia, (Nuraddis et al., 2014) 89.3% and 87.1% around Jimma town, Western Ethiopia and elsewhere in the world (Mbuh et al., 2008) 96.25% and 86% in Bokova, a rural area of Buea Sub Division, Cameroon, in sheep and goats respectively. This is higher prevalence in sheep might be due to the grazing habit of sheep when they graze closer to the ground might be consumed the infective stage of the parasite with the grass from the ground where as goats are mostly not grazing close to the ground rather they are brose the leaf of the tree which is above the ground that prevent themselves from exposure to the infective stage of the parasites.

Female animals were found with higher prevalence of helminthes infection rate than male animals and there was statically significant (P<0.05) between them in the present study. The prevalence of GIT helminthes parasite in this study in female and male animal was 59.9% and 40.1% respectively. This finding agreed with other studies which are reported higher prevalence in female than male (Tesfaheyw et al., 2012) 62.53% and 60.41% in Haremaya, South Eastern Ethiopia, and (Shimelis et al., 2011) 48.80% and 42.42% in North Gondar zone, Northwest Ethiopia in female and male animal respectively. The higher prevalence in female animals observed in the study due to male animals are slaughter early and more samples were collected from the female, and female animals immunity may be lowered than male animal during lactation and pregnancy and also male animals are kept indoor for the purpose of fattening where as female animals are not manage just like a male animal which are kept on communal grazing on the field.

Higher prevalence was observed in young animal than adult animal in this study and there was statically significant (P<0.05) between age group. The prevalence of GIT helminthes parasite in this study young and adult animal was 67.9% and 53.6%, respectively. This study is similar to other finding that reported higher prevalence in young animal than adult animal such as (Welemehret et al., 2012) 56.25% and 35.33%, in and Around Mekelle Town, Northern Ethiopia, (Diriba and Birhanu, 2013) 79.6% and 62.4% in and around Asella, South Eastern Ethiopia. This might be due to young animals are susceptible to different diseases including parasitic infection due to low development of immune response to the infection, lack of adaptation and resistance before they exposure to infection whereas adult animals are resistant and adapted to infection due to rapid response of immunity to the infection due to previous exposure of infection which remove the parasite before it attach to its predilection site.

The study showed that higher prevalence of helmintic infection was observed in poor body condition animals as compared to medium and good body condition animals and there was highly statically significant (P<0.000) between body condition. The prevalence of helminthes parasite in these studs in relation to body conditions 89.9%, 59% and 44% in poor, medium and good body condition. This finding is similar to other studies which is (Diriba and Birhanu, 2013) 81.3%, 69.5%, and 61.5% in and around Asella, South Eastern Ethiopia in poor, medium and good body condition respectively. The higher prevalence in poor body conditions might be caused by due to malnutrition, other concurrent diseases or current parasitic infection that lead to lower the immune status of the animal to different diseases or infective stage of the parasites (Welemehret et al., 2012).

The major helminthes parasite that has been observed in this study were *Strongyle* type of species (Nematodes), *Fasciola* and *Paramphistomum* species (Trematode) and *Monesia* species (Cestode) parasites of small ruminant in this area. The overall prevalence of this parasite in this animal was 22.92% *Strongyle,* 14.1% *Fasciola*, 7.03% *Paramphistomum* and 5.73% *Monesia* species of helminth parasite in small ruminants. This finding agreed with (Welemehret et al., 2012) in and around Mekelle Town, Northern Ethiopia, and elsewhere in the world (Lone et al., 2012) in Ganderbal, Kashmir. The highest prevalence was seen in *Strongyle* type of parasite than other helminth parasites this might be due to the area is suitable to the survival of the infective stage of the parasite which means there was optimal moisture and temperature that helps the egg of parasite to hatched and develop the infective stage outside the definitive host. The development of larvae in the environment depends upon warm temperature and adequate moisture. In most tropical and sub-tropical countries, temperatures are permanently favourable for larval development in the environment. The survival of larvae in the environment depends upon adequate moisture and shade. Desiccation from lack of rainfall kills eggs and larvae rapidly and is the most lethal of all climatic factors. Larvae may be protected from desiccation for a time by the crust of the fecal pat in which they lie or by migrating into the soil (FAO, 2012).

CONCLUSION AND RECOMMENDATIONS

Enemay district has large number of small ruminant that are managed under extensive management system in mixed farming system that serve as source of food and cash income for rural society of the district. The small ruminants was affected by different helminth parasites such as *Strongyle* type, *Fasciola* species, *Paramphistomum* and *Monesia* specie of parasite and sometimes by mixed parasitic infection, Strongyles were the most prevalent parasites encountered in the area followed by *Fasciola,* which causes loss of production, reducing growth rate and death of small ruminants due to lack of proper management like regular deworming, improper feeding, animals are keeping on communal grazing on the field and lack of adequate animal health and production extension workers that give to advise to the animal owner. Based on the above conclusion the following recommendations are forwarded: Strategic deworming of small ruminants using a broad spectrum anthelmintics should be practiced, the government should be creating awareness to the animal owners to avoid communal grazing and keep their animal indoor to improve the production and productivity of the animal, the animal owner should be restricted their animal to go the field during parasitic season of the year and further studies on epidemiology of GIT helminthes parasite of small ruminants should be conducted on the study area.

Author's contribution

A Shime performed the data collection, laboratory works and write up of the manuscript. S Derso analyzed the data and revised the manuscript. All authors read and approved the final manuscript.

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Conflict of interests

There is no conflict of interest in publishing this article.

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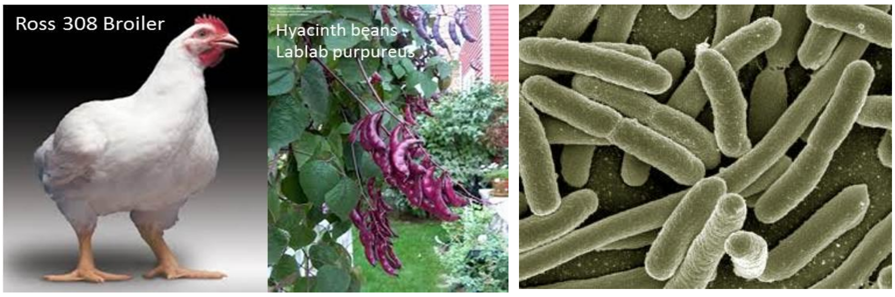

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(Revised on 22 January 2015)

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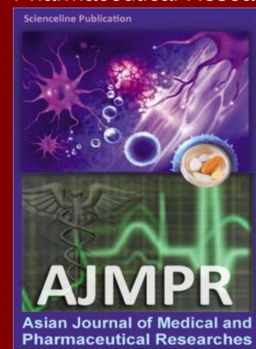

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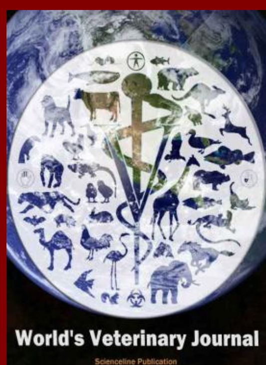

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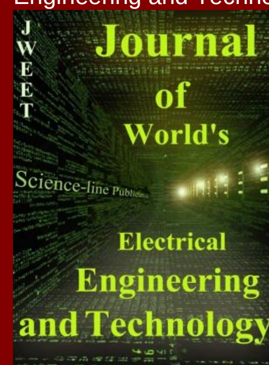

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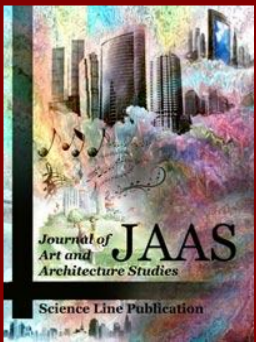

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