International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
DOI: 10.22192/ijamr **Volume 4, Issue 3 -2017**

Research Article

DOI: http://dx.doi.org/10.22192/ijamr.2017.04.03.004

Prevalence and associated risk factors of small ruminants haemonchosis in Debra-Zeit Elfora export Abattor, Beshoftu town, Ethiopia

Belete Abdo, Wale Tesfaye, Adisu Agaro, Bizuayehu Eshetu and Kero Mekuria
School of Veterinary Medicine, Wolaita Sodo University, Wolaita Sodo, Ethiopia
Corresponding Author: *twalelgn@yahoo.com*

Keywords

Abomasum;
Bishoftu;
H.contortus;
Prevalence;
Risk Factors;
Shoats.

Abstract

Haemonchosis have been recognized as a major constraint to both small and large-scale small ruminant production in developing countries. A cross- sectional study was carried out in sheep and goats from November, 2015 to April, 2016 in Debra-zeit ELFORA export abattor in Beshoftu town, with the objectives of evaluating the current status of *H.contortus* and the risk factors associated with the study area. The study animals were 845 small ruminants in which 425 male sheep's and 420 male goats slaughtered in Debra-zeit ELFORA export abattoir. The study revealed that an overall infection rate was 63.4% and among the samples from sheep 296 (69.6%) and 240 (57.1%) from goats were detected positive for *Haemonchus contortus* with a statistical significant difference ($p < 0.05$) between the sheep and goat. The prevalence of haemonchosis in young and adult was 66.9% and 59%, respectively. There was statistical significance ($p < 0.05$) between age groups. There is no statistical significance ($p > 0.05$) among the body condition of small ruminants. In the current study, a high infection rate with *H. contortus* was observed in small ruminants during the study period affecting health of those animals and appropriate control measure should be instituted.

1. Introduction

Livestock production in Ethiopia's agricultural economy is an important sector providing a significant contribution to gross domestic and export products and raw materials for industries (Bekele Jemere *et al*., 2011). Among this livestock population, small ruminant constitute a major part (Kassaye Enquebaher and Kebede Etsay, 2010). There are about 25.5 million sheep and 24.06 million goats in the country playing an important role in the livelihood of resource poor farmers (Guash Abay *et al*., 2015). Small ruminants are important source of income for agricultural community and are one of Ethiopia's major sources of foreign currency through exportation of live animals, meat and skin (Dasie Sheferaw *et al*., 2010).

The contribution from this huge livestock resource to the national income is small due to several factors. The major constraints of small ruminant production in Ethiopia are diseases of various etiological origins, feed shortage and poor management (Bekele Jemere *et al*., 2011; Guash Abay *et al*., 2015). Parasitic diseases are a global problem and considered as a major constraints in the health and product performance of livestock (Abera Melese *et al*., 2010). They cause lowered productivity and high economic losses affecting the income of small holder dairy farming communities (Shimelis Dagnachew *et al*., 2011)

Haemonchosis is primarily a disease of tropical and sub tropical regions. However high humidity, at least in microclimate of the faces and the herbage is also essential for larval development and their survival. It is a serious health problem in farm animals. The frequency and severity of the disease largely depends on the rainfall in any particular area. Surveys in countries around the world have shown that amongst domestic animals, sheep and Goats suffer more frequently from haemonchosis (Nwosu *et al*., 2007). Farm animals are as whole integral parts of country agricultural system and raised both in the highland and lowland area. Various report shows that the live stock subsector contributes 12-16% of the total and 30-35% agricultural GDP, respectively (MOI, 2005). Economic losses, lowered productivity reduced animal performance and weight gain, retarded growth, cost of treatment and mortality are caused by parasites affecting the income of Smallholder farming communities. Most of the losses are caused by the gastro-intestinal nematodes (Badran *et al*., 2012).

Gastrointestinal nematode is one of the major constraints for small ruminant's production in the study area. Understanding the current situation of haemonchosis infections in the area could be the basis for all possible actions including its control and eradication. Most previous studies in Ethiopia were based on coprological examinations, which are less sensitive in identifying the nematode (haemochus) species and there was not any documented data on the distribution of the parasite in the area. Therefore, the objectives of this study were: to determine the prevalence of small ruminant haemonchosis in study area and to evaluate the influence of host related risk factors on the occurrence of small ruminant haemonchosis in the study area.

2. Literature Review

2.1 Etiology

Haemonchosis in small ruminants is caused by *Haemochus contortus. H. contortus* is a gastro intestinal parasitic nematode, which infects small ruminants such as sheep and goats. Classification of *Haemonchus contortus*: Kingdom: Animalia, Phylum: Nematoda, Class: Secernentea, Order: Strongylida, Family: Trichostrongylidae, Genus: *Haemonchus.* Species: *Haemonchus contortus* (Lerato, 2012). The majority of gastrointestinal strongylida of ruminants belong to the family Trichostrongylidae. The genus *Haemonchus* is in the sub-family of Haemonchinae and consists of four main species in domestic ruminants; *H. contortus* (in ovine and caprine), *H. placei* and *H. similis* (in bovine) and *H. longistipes* (in camel) (Inaam *et al*., 2007).

2.2 Life Cycle of Haemonchus Contortus

An understanding of the life cycle of *Haemonchus* is important for effective control programs. Adult *Haemonchus* worms live in the abomasum and lay eggs that are passed in the faces. Each adult female parasite has a tremendous egg laying potential (5000-10000 eggs per day). The eggs that are excreted together with faces hatch and pass through three larval stages, the third stage (L3) being infective to host. L3 then penetrates the mucus membrane of the abomasum and molt to L4 within the next few days. L4 remain in the mucus membrane for 10-14 days after which they emerge and molt into adult stage (L5) and females start egg production within 14-21 days post infection (Tadesse Eguale, 2005).

In ideal environment such as warm and humid, a first stage larva will hatch from an egg within a day. This larva is small and slender and feeds on fecal bacteria. It molts to a larger second stage larva (LSSL) which continues to feed on bacteria before molting to the third stage. The span from hatching to the third stage larva (L3) under ideal conditions is approximately 7 days. The L3 retains the cuticle from the second stage over its own cuticle as a protective sheath. This sheath increases the resistance of the larva to adverse weather conditions. However, at this stage the third stage larva L3 is prevented by its sheath from eating and must survive on energy reserves. The cuticle of *H. contortus* forms a small lancet in its oral opening that is used to pierce the mucosa, causing capillary bleeding on which the worm feeds. Blood feeding begins at the fourth larval stage (Jill, 2009).

The pre-patent period (PPP) is about 3 weeks when the internal and external conditions are favorable. Otherwise, the L4 may enter into a phase of arrested development or hypobiosis temporarily (Waller *et al*., 2004). *H. contortus* is capable of undergoing a period of developmental arrest known as hypobiosis (O'Connor *et al*., 2006). When this takes place, larvae in the host do not develop directly into adults but remain as fourth stage larva (L4) in the gastric glands of the abomasum for weeks or months. The portion of hypobiotic worms is usually greatest when conditions outside the host are unfavorable for parasite development so that any eggs shed into the environment would be unlikely to develop and survive (Gatongi *et al*., 1998 and O'Connor *et al*., 2006).

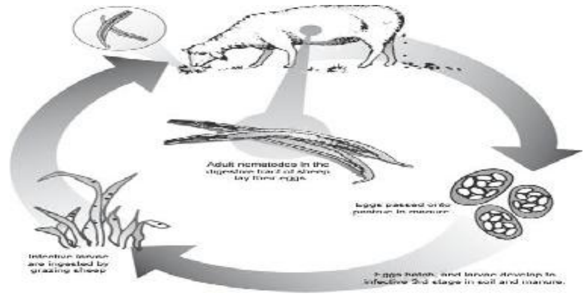

Figure 1: Life cycle of *Haemonchus contortus (*Lerato, 2012).

2.3 Epidemiology

Haemonchus contortus occurs in nearly all subtropical and temperate areas of the world in the abomasum of ruminant livestock and also in many wild ruminants. Gastrointestinal nematode infection ranks highest on a global index, with *H. contortus* being of overwhelming importance (Maphosa *et al*., 2010). It has been ranked as the most important parasite of small ruminants in all regions across the tropics and subtropics and causes an insidious drain on production, weight losses and even mortality in young animals (Bhat *et al*., 2011). The outcome of this parasite depends on various intrinsic and extrinsic factors (Achi *et al.,* 2003).

2.3.1 Intrinsic Factors

Haemonchus contortus is a highly prolific, blood feeding parasite with various strategies to escape adverse climatic conditions and immune reactions of the host. A mature female can produce 5,000-7,000 eggs per day (Aumont *et al*., 2003). Hypobiosis usually follows the onset of cold autumn/winter conditions in the northern hemisphere or very dry conditions in the subtropics and tropics. This might be an environmental stimulus received by the free living infective stages prior to ingestion by the host or it could be an evolutionary parasitic adaptation to avoid adverse climatic conditions for survival of the free living stages by a significant number of parasites remaining as sexually immature stages in the host until more favorable conditions return (Getachew Tilahun *et al*., 2007).

2.3.2 Extrinsic Factors

These factors are including temperature, rainfall, humidity and vegetation cover, influence patterns of parasite development. In most tropical and sub-tropical countries, temperatures in the environment are permanently favorable for larval development. The ideal temperature range for larval development of many nematode species in the microclimate of the pasture or vegetation is between 22 and 26°C while the optimal humidity is close to 100 %. Desiccation from lack of rainfall kills eggs and larvae rapidly, and is the most lethal of all climatic factors (Getachew Tilahun *et al*., 2007; Tibeso Badaso and Mekonnen Addis, 2015).

2.3.3 Nutritional Status

Nutrition can influence the development and consequences of parasitism in three different ways: it can increase the ability of the host to cope with the adverse consequences of parasitism (resilience); it can improve the ability of the host to contain and eventually to overcome parasitism (resistance) by limiting the establishment, development and fecundity of the parasites and/or it can directly affect the parasite population through affecting the intake of certain anti-parasitic compounds (Coop and Kyriazakis., 2001).

2.3.4 Nature of the Host

Host factors such as age, breed, nutrition, physiological state and presence or absence of inter-current infections influence the incidence rate and severity of infection with gastrointestinal (GI) nematodes in sheep and goats. Kids and lambs are known to be more vulnerable compared to adults and worm burdens decrease with increasing age. Clinical parasitic gastroenteritis has been reported in young animals while infections in mature animals are generally subclinical in nature. The lower prevalence in adults has been attributed to immunological maturity as the animals grow and the increase in acquired resistance due to repeated exposure. Some breeds of sheep and goats are known to be genetically resistant to gastrointestinal nematodes infections than others (Seth, 2014).

2.4 Clinical Sign

In hyperacute cases, sheep die suddenly from haemorrhagic gastritis. Acute haemonchosis is characterized by anemia, variable degrees of edema of submandibular form and ascites are most easily recognized, lethargy, dark colored faces and falling wool (Taylor *et al,* 2007). Diarrhea is not generally a feature but occurring only in infections complicated by the presence of such species as *Trichostrongylus* species and *Cooperia* species. Lambs are the most seriously affected members of the flock but older sheep under stress also may have fatal anemia (Bowman, 2003). Chronic haemonchosis is associated with progressive weight loss, weakness and anemia is characteristic of the chronic infection, often of low worm burdens (Urquhart *et al*., 1996).

The mucus membranes appear white or pale in contrast to the normal bright pink color. Bottle-jaw is swelling, or edema, in the lower jaw of a goat. Gastrointestinal parasite infestation causes a deficiency of proteins in the blood due to an increased demand for protein and a decrease in the nutrient supply because of a lack of appetite (Min *et al*., 2005). In heavy infestations and in young animals, a wasting away can be observed in which the animal has a low body conditioning score and a dull coat and appears unenergetic. Diarrhea may also develop as a consequence of infestation but the animal usually dies before it develops (Tyrell *et al* 2008).

2.5 Pathogenesis

Haemonchus contortus is the species with greatest pathogenic and economic importance in small ruminants (Odoi *et al*., 2007). The pathogenesis of haemonchosis is an acute haemorrhagic anemia due to the blood-sucking habits of the worms and ranked as the most important parasite of small ruminants in all regions across the tropics and subtropics. *Haemonchus contortus* causes an insidious drain on production, weight losses and even mortality in young animals (Bhat *et al*., 2011). As the worm's blood-consuming lifestyle, the major effect of haemonchosis is anemia. Logically, higher worm burdens result in greater blood loss. An adult worm is capable of consuming 0.05 ml of blood per day. With low level infections, blood loss would not be clinically significant. However, with favorable conditions infections can easily increase to tens of thousands of worms, producing a rate of blood loss that exceeds the host's ability to regenerate red blood cells. Stress and poor nutrition worsen the effects of infection because they weaken the host's immune response to the parasite (Jill, 2009).

In cases of acute haemonchosis, anaemia becomes apparent about two weeks after infection. The pathogenic effects result from the inability of the host to compensate the blood loss. Each worm removes roughly 50 ml of blood from the lesions. An average infection contains of approximately 5,000 worms, so that a sheep may lose 250 ml blood daily. In cases of a small amount of blood loss the host might be able to compensate it and the infection is subclinical. In heavier infections (up to 30,000 worms), healthy sheep may die suddenly from severe haemorrhagic gastritis (hyperacute haemonchosis) (Janina, 2005).

In cases of acute haemonchosis, at necropsy, there may be between 2000 and 20,000 worms present on the abomasal mucosa which shows numerous small haemorrhagic lesions. The abomasal contents are fluid and dark brown due to the presence of altered blood. The carcass is pale and edematous and the red marrow has expanded from the epiphyses into the medullary cavity (Taylor *et al*., 2007). The generalized edema and fluid throughout of the body cavities secondary to hypoproteinemia. A reduction of plasma protein concentration has been found in haemonchosis due to blood loss and hemorrhagic gastritis, and leakage of proteins to gastric lumen occurs as a result of disruption of intercellular unions and increased permeability (Tehrani *et al*., 2012).

2.6 Diagnosis

Haemonchus contortus infection is clinically diagnosed by anemia, dehydration, sub-mandibular internal fluid accumulation that results in the formation of a bottle neck, diarrhoea and low packed cell volume (PCV). Infection also results in retarded growth, reduced reproductive performance, general illness and death (Inaam *et al*., 2007). Supplementary diagnosis is achieved through the use of microscopic techniques by the recovery of *H. contortus* eggs from stool samples. Because the eggs of many important genera are morphologically similar and hard to identify to species level, a better way to delineate species is by larval culture and identification of 3rd stage larvae (Harmon *et al*., 2007).

Diagnosis is also performing a fecal egg count test, or using the FAMANCHA system to determine the level of infestation. The FAMANCHA system involves comparing the color of the mucous membrane of the eye against a FAMANCHA color chart in order to determine the extent of anemia and the level of infestation by internal parasites (Waller, 2004). With the help of a color chart, animals are scored in one of five color categories red, nonanemic, anemic, very pale, and severely anemic) (Vatta and Lindberg, 2006).

2.7 Treatment and Self-cure Phenomenon

There are various products in multiple drug classes available to combat parasitic nematodes. Classes: the benzimidazoles, the imidazothiazoles and the macrocyclic lactones (Zajac, 2006).

Table 1: List of some recommended drugs against haemonchosis.

Chemical group	Anthelmintics	Prescribed dose
Benzimidazoles	Albendazole	7.5 mg/kg
	fenbendazole	7.5 mg/kg
Imidazothiazoles	Levamisole	8 mg/kg
Macrocyclic lactones	Ivermectin	0.2 mg/kg (sheep only)
	Moxidectin	0.2 mg/kg (sheep only)

Source: (Zajac, 2006).

Self-cure phenomenon is the important for the epidemiology of haemonchosis. In this phenomenon, expulsion of adult parasite from the host takes place (Nahar *et al*., 2015). The most frequent described protective immune response against the abomasal nematode *H. contortus* in sheep is the self-cure reaction. The self cure reaction was considered as first evidence of immune expulsion of gastrointestinal nematodes and it was the most protective immune response against abomasal nematodes. This reaction is dependent on antigens associated with the living larvae and which act locally. Both host and parasite genetic factors may influence the occurrence of the self-cure reaction. Self-cure is accompanied by a transient rise in blood histamine, an increase in the complement- fixing antibody titer and intense mucosal edema in the abomasum (Tibeso Badaso and Mekonnen Addis, 2015).

2.8 Control and prevention

The aim of most control strategies is to is not to eliminate the parasite, but to keep these populations under a threshold level and thus to eliminate their harmful effects (Chandrawathani, 2004). The success or failure of any control strategy can be evaluated in terms of immediate and/or long term objectives, the ultimate goals being increased production, minimizing risks of drug resistance and addressing consumer and environment associated problems (Larsen, 2000). A combination of treatment and management is necessary to control parasitism so that it will not cause economic loss to the producer (Margo, 2006).

2.8.1 Targeting the Parasite in the Host

Chemotherapy: The control of GIN infections is largely based on preventive or therapeutic use of anthelmintic drugs. On most farms the flocks are traditionally treated two or more times per year. Mostly, these strategic treatments are performed in spring at the beginning of the grazing period to prevent the contamination of the pasture and at the end of summer, when infestation of the pasture with larva and of the animals with adult worms usually is high. Additional treatments are administered whenever clinical signs become obvious (Miriam, 2009).

2.8.2 Targeting the Microenvironment

A. Pasture management

Numerous techniques can be used to control parasitism. Pasture management should be a primary tool to control internal parasites. Sheep and goats ingest infective parasite larva from pasture. The rate at which they are ingested can be controlled through pasture management. Larva migrates no more than 12 inches from a manure pile. Livestock not forced to eat close to their own manure will consume fewer larva. Providing areas where animals can browse (eat brush, small trees, etc.) and eat higher of the ground helps to control parasite problems. Decreasing the stocking rate decreases the number of worms spread on a pasture. The more animals you have on one pasture, the more densely the worms are deposited. Animals on densely stocked pastures are more likely to have parasite problems (Min and Hart, 2003).

Grazing sheep and goats with cattle, or in a rotation with cattle, can also reduce internal parasite problems. Cattle do not share the same internal parasites as sheep and goats. Cattle consume sheep and goat parasite larvae, which helps “clean” the pasture for the small ruminants. Certain forages have also been shown to control parasite problems. Tannin-rich forages, such as sericea lespedeza, have been shown to help reduce internal parasite egg counts (Shaik *et al*., 2004).

B. Nutritional Supplementation

Studies show that healthy adult animals rarely need to be dewormed. Most animals develop immunity against internal parasites, which keeps the parasites from reproducing but doesn't kill them. It is young animals that have not developed immunity and those animals whose immunities are compromised that are the most affected by *H. contortus* (Wells, 2005). Nematodes in resistant hosts lay fewer eggs which may be less viable and take longer to develop (Stear *et al*., 2007). Therefore, the better the host's immune system, the less likely they are to show signs of infection. Sheep with healthy immune systems tend to have healthier digestive tracts that the worms are less adapted to colonizing (Wells, 2005). Protein supplements as a part of a herd's diet or before and during infection can prevent or reduce clinical signs of infection by *H. contortus* (Strain and Stear, 2001). Additional dietary protein enhances the ability of the infected host to repair mucosal damage (Stear *et al.*, 2007).

C. Biological control

Concerted scientific interest in the possibility of biological control of nematode parasites livestock first emerged 10 to 15 years ago. This was brought about by the serious problem of the rapid development of anthelmintic resistance in parasite populations worldwide as well as problems in managing parasitic problems in organic livestock production systems. The aim of any biological control strategy is not to eliminate the target pest organism, but to keep these populations under a threshold level and thus to eliminate their harmful effects. With regards to nematode parasites, attention was initially directed towards the nematode destroying microfungi found in the soil-pasture-microenvironment. These fungi are found in a variety of habitats especially in organically rich environments such as compost and aged faces on pasture. Two main groups have been identified: predacious fungi and that produce nematode trapping structures such as knobs, branches and rings and endoparasitic fungi that infect nematodes by sticky spores that are eaten or stick to the nematode and finally puncture the nematode (Chandrawathani, 2004).

2.9 Status of Haemonchosis in Ethiopia

In Ethiopia, several studies have been conducted on small ruminant helminthiasis in various regions reporting average prevalence of 67.72% which ranges from 50.4 to 84.1%. Nematode infection is rampant in most developing countries where poor pastures and quantities of nutritious feed consumed do not cover the requirements of animals. Also there is insufficient veterinarian care in the country and the environment is conducive to nematode growth and transmission (Alemayehu Ragassa *et al*., 2006). Some of the studies conducted in the country are showed in the following tables.

Table 2: Prevalence of haemonchosis in different parts of the Ethiopia in different years.

Site or study area	Prevalence	Reference
Arsi Negelle	Sheep and goats (63.8%)	Tibeso Badaso and Mekonnen Addis, 2015
Bedelle town	Sheep (69.5%), goats (65%)	Tefera Mulugeta *et al*., 2011
Bishoftu town	Sheep and goats (77.3%)	Gonfa Shankute *et al*., 2013
Bishoftu	Sheep (91.2%) and goats (82.9%)	Bersissa Kumsa and Wossene Abebe, 2006
Finoteselam	Sheep and goats (71.03%)	Zelalem Mengist *et al.*, 2014
Gonder town	Sheep and goats (80.2%)	Tewodros and Girja, 2012
Haramaya	Sheep (90.1%) and goats (81.8%)	Shimelis Argaw *et al*., 2014
Wollaita Soddo town	Sheep (61.63%) and goats (54.76%)	Haileleul Nigussie, 2002
Arid and Semi arid zone of eastern Ethiopia	Sheep (96.5%) and goats 100%)	Abebe Wossene and Esayas Gelaye, 2001

3. Materials and Methods

3.1 Study Area

The study was conducted from November, 2015 to April, 2016 in Debra-zeit ELFORA export abattoir in Beshoftu town. Debre-zeit has an altitude of 1850 meter above sea level and experiences a bimodal rainfall pattern with a long rainy season from June to October and a short rainy season from March to May. The average annual rainfall and averages maximum and minimum temperature of the area are 800mm, 26 and 14^0C, respectively. The geographical (astronomical) location of Bishoftu town is approximately located at 8° 44' N latitude and 38° 57' E longitudes, 47 km South East of Addis Ababa at an altitude of 1950 meter above sea level (CSA, 2010).

3.2 Study Animals

The study animals were 845 small ruminants in which 425 male sheep's and 420 male goats slaughtered in Debra-zeit ELFORA export abattoir. Animals were indigenous breeds kept under traditional management system. The study animals were small ruminants of local breed with different age, origin and body condition those were brought to slaughter. In this study, the origins of the animals were recorded from the history of the animal merchants that provide animals for the abattoir.

The age of the sheep and goat was characterized using teeth eruption. Conventionally, those animals with the age of less than one year were considered as young while those greater than or equal to one year were included as adults according to the classification of age groups (Vatta *et al*., 2006). The body condition score was determined and grouped as medium and good (ESGPIP, 2007).

3.3 Study Design

A cross-sectional study was carried out from November, 2015 to April, 2016. It was carried out by collecting samples associated with haemonchus in small ruminant in Debra-zeit ELFORA export abattoir in Bishoftu Town, East Shoa Zone, Oromia National Regional State, Ethiopia.

3.4 Study Methodology

3.4.1 Ante-mortem Examination

Ante mortem examination was performed a few hours before slaughtering from randomly selected small ruminants (sheep and goats). The age and body condition of small ruminants were determined before the animals were slaughtered by standard methods given by (Vatta *et al*., 2006) and (ESGPIP, 2007) respectively. The animals in the present study were young and adult. There were no poor body condition animals during study periods since the owners of hotels and restaurants preferred animals with better body condition for slaughter.

3.4.2 Postmortem Examination

During postmortem examination, the abomasums was ligated at both ends to avoid leakage and separated from omasum and duodenum. Then the abomasums was opened along its greater curvature and close visualization was made for the presence of adult *Haemonchus* parasite. The abomasums wall was carefully observed for any gross changes including its contents and the adult *H. contortus* worms were identified visually by standard method (Urquhart *et al*., 1996).

3.4.3 Sample Size and Sampling Methods

To maximize the number of animals and to evaluate the system at the prevalence level the sample size was determined by using the formula given by Thrusfield (2005).

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

Where: n= required sample size; P_{exp}=Expected prevalence=Desired absolute precision. There is a not previous study on the prevalence of small ruminant haemonchosis in the area. Thus, 50% expected prevalence was used to determine the minimum sample size, 95% confidence interval and 5% desired precision. In this study, the sample size was increased from required calculated sample size (384) to 845.

Simple random sampling technique was employed to determine the prevalence of small ruminant haemonchosis. A simple random sampling method was used to select the representative sample of the subject in this study.

3.5 Data Analysis

Microsoft excel software was used to store the data and analysis of simple descriptive statistics. Computation of descriptive statistics was conducted using IBM-SPSS version 20.0. Descriptive statistics such as percentages, proportions and frequency distributions are applied to compute some of the data. The prevalence of the haemonchosis was calculated by dividing the number of sheep and goats harboring the parasite by the number of sheep and goats examined. Pearson's chi-square (χ2) to measure association between prevalence of the haemonchosis with the species, age, origin and body condition was used as the statistical tool. Confidence level was held at 95% and statistical analysis for the difference in prevalence of *H. contortus* among risk factors are considered significant when the p-value was less than 0.05 ($P < 0.05$).

4. Results

A cross sectional study was carried out to determine the prevalence of haemonchosis in small ruminant from November, 2015 to April, 2016 in Debra-zeit ELFORA export abattoir. In this study a total of 845 sheep and goats were examined using postmortem examination for the presence or absence of *H. contortus*. The overall prevalence of haemonchosis in small ruminants was found 536 (63.4%) in the study area.

Table 3: Relative prevalence of Haemonchosis between sheep and goats

Species	No of examined animals	No of positive	Prevalence (%)	χ2	P-value
Sheep	425	296	69.6%	14.239	0.000
Goat	420	240	57.1%		
Total	845	536	63.4%		

The prevalence of haemonchosis was found higher in sheep (69.6%) compare to goats (57.1%). There was statically significant difference ($p = 0.000$) on the occurrence of haemonchosis between species of shoats (Table 3).

Table 4: Relative prevalence of Haemonchosis based on age.

Age	No of examined animals	No of positive	Prevalence (%)	χ2	P-value
Young	474	317	66.9%	5.526	0.019
Adult	371	219	59.0%		
Total	845	536	63.4%		

In the present study, higher prevalence of haemonchosis infestation was observed in young animals (66.9%) as compared to adult (59.0%). There was statically significant difference ($p = 0.019$) between the two ages groups (Table 4).

Table 5: Prevalence of Haemonchosis based on body conditions.

BCS	No of examined animals	No of positive	Prevalence (%)	χ2	P-value
Medium	494	320	64.8%	0.928	0335
Good	351	216	61.5%		
Total	845	635	63.4%		

The prevalence of haemonchosis was different with different body condition of small ruminants. It was found slightly higher in medium (64.8%) than good body condition (61.5%). There was no significant difference ($p > 0.05$) between body conditions of small ruminats (Table 5).

Table 6: Prevalence of Haemoncosis based on origin.

Origin	No of examined Animals	No of positive	Prevalence (%)	χ2	P-value
N. Borana	212	117	55.2%	14.944	0.001
Ginka	208	123	59.1%		
Yabello	425	296	69.6%		
Total	845	536	63.4%		

The highest prevalence was observed in animals that were brought from Yabello (69.6%) followed by Ginka (59.1%) and Negelle borana (55.2%). There was statistical significance variation (p = 0.001) in prevalence of *Haemonchus contortus* in the different origin of the animals (Table 6).

5. Discussion

The present study revealed an overall prevalence of haemonchosis infestation in small ruminants was found to be 63.4%. The prevalence between species was 69.6% in sheep and 57.1% in goats. Still it is a high prevalence of haemonchosis in the small ruminants. This finding is lower than the results of previous studies in sheep and goats from different parts of Ethiopia. Shimelis Argaw *et al* (2014) 90.1% in sheep and 81.8% in goats in the prevalence of abomasal nematodes in sheep and goats slaughtered at Haramaya municipal abattoir, eastern Hararghe; Abebe Wossene and Esayas Gelaye (2001) 96.5% in sheep and 100% in goats in the arid and semi arid zone of eastern Ethiopia; Bersissa Kumsa and Wossene Abebe (2006) 91.2% in sheep and 82.9% in goats of Ogaden region slaughtered at Debre-zeit ELFORA export abattoir; Zelalem Mengist *et al* (2014) in the study conducted in and around Finoteselam has reported prevalence of haemonochosis among small ruminants as 71.03% and Gonfa Shankute *et al* (2013) also reported higher prevalence in the study of An Abattoir Survey on Gastrointestinal Nematodes in Sheep and Goats in Hemex-Export Abattoir as 77.38%.

This difference might be due to the difference between the management system of examined animals, sample size and geographical and environmental location of the area. And also might be due to sheep and goats are managed under extensive managements system with the high stocking density, where large numbers of animals graze together throughout the year in communal grazing land and inadequate nutritional status. A variety of factors such as, age, grazing habits, level of education and economical capacity of the community, presence or absence of inter-current infections, the standard of management and anthelmentics usage are crucial elements influencing the development, distribution and survival of parasites. Other factors that induce this variation might be due to presence of sufficient rainfall and moisture during the study period was favored the survival of infective larvae in pasture and higher probability of uptake of the infective larvae leading to higher prevalence.

The percentage prevalence of *H. contortus* in sheep and goats was recorded as 69.6% and 57.1% respectively. There was significant difference (P<0.05) in the prevalence of haemonchosis between sheep and goats, indicating that sheep's are more susceptible to the infection than goats. The results of the present study are supported by Tewodros Fentahun and Girja Luke (2012) who reported 81.2% and 73.5% in sheep and goats respectively in Gonder town; Tefera. Mulugeta *et al* (2011) who reported 69.5% and 65%in sheep and goats in and around Bedelle; Haileleul Nigussie (2002) who reported 61.63% and 54.76% in sheep and goats respectively in and around Wolaita Soddo. In contrary to the current finding; Zelalem Mengist *et al* (2014) reported that the rate of the parasite was higher in goat compared to sheep with the prevalence of 71.3% and 67.57% respectively.

The higher prevalence of haemonchosis in sheep than goats might be attributed to a variety of factors like ground grazing habit of sheep and usually graze very close to the soil which might be helpful in the acquisition of more infective larvae (L3) of H. contortus from the contaminated herbage. Such differential prevalence in sheep and goat also might be due to the fact that goats browse on shrubs and small trees where translation of infective larvae to such height seems impossible.

The present study revealed that there was significant difference based on age (P < 0.05) with the prevalence of 66.9% and 59.0% in young and adults respectively. The present finding on the prevalence of haemochosis between two ages was in line with previous findings which were reported by Gonfa Shankute *et al* (2013) as 86.9% and 86.57% in adult and young respectively in Hemex-export abattoir and Haftamu Meselea *et al* (2013) who reported 37.9% and 49% in young and adult respectively in and around Alameta Woreda.

This might be due to that; the more infection in young is because of their low resistance or greater susceptibility due to the fact that these small ruminants have not been exposed earlier in the infection. During the first year of their life they fed, grazed and browse on grasslands, thus the first stage of their exposure to infection with parasites occurs. It was also explained that low level of parasitism reported in the adult animals is due to the development of significant immunity with the course of time. Gradually, as the exposure to parasitic infection increases, the immune system of host animals builds up especially against *Haemonchus spp* and age resistance develops.

With regard to the body condition of the examined small ruminants the prevalence rate was higher in medium body condition small ruminants compared to the good body condition small ruminants with the prevalence of 64.8% and 61.5%, respectively. There was not statistically significant ($P > 0.05$) between body condition and haemonchosis in small ruminants this indicated that both body condition animals were equally susceptible for haemonchosis. This current study was agree with the previous works of Gonfa Shankute *et al* (2013) who reported prevalence of 77.21% and 84.44% in medium and good body condition animal; and Tibeso Badaso and Mekonnen Addis (2014) indicated that the rate of the parasite was higher in medium body condition small ruminants compared to that of good body condition with the prevalence of 67.3 and 55% respectively in small Ruminants Haemonchosis: Prevalence and Associated Risk Factors in Arsi Negelle Municipal Abattoir, Similarly, Tewodros Fentahun and Girja Luke (2012) indicated that the rate of the parasite was higher in medium body condition small ruminants than that of good body condition small ruminants with the prevalence of 81.2% and 73.6%, respectively; but disagrees with the research reported by Alemayehu Ragassa *et al*. (2006) who report prevalence of haemonchosis was found to be higher in good body condition than that medium body condition.

This could be explained by the fact that loss of body condition in the study animals might be due to other factors, such as seasonal change of forageable feed staff, Poor management system and the presence of other concurrent diseases which lead to poor immunological response to infective stage of the parasites.

The prevalence of the *H. contortus* in small ruminants that originated from different sites of the study area indicated different prevalence. The prevalence of the haemonchosis was higher in those small ruminants originated from Yebello with the rate of 69.6% followed by shoat originated from Ginka and negelle borana with the rates of 59.1% and 55.2%, respectively and there is statistical difference of the prevalence of the parasite ($P < 0.05$).

This is might be due to the fact that sheep and goats of the area are managed under extensive management system with high stocking density where large numbers of animals graze together thought the year in communal grazing land which leads to more contamination of the pasture by eggs and then increases the number of worms spread on a pasture. Another possible explanation might be due to inadequate nutritional status, poor veterinary infrastructure and services of the area. This difference also might be due to the difference between the geographical and environmental location of the area, the standard of management and anthelmentics usage are crucial elements influencing the development, distribution and survival of parasites.

6. Conclusion and Recommendations

Gastrointestinal nematode parasites are the major animal health constraints in small ruminants' production. *H. contortus* has been ranked as the most important parasite of small ruminants in all regions across the tropics and subtropics and causes an insidious drain on production, weight losses and even mortality in young animals. The current study revealed that prevalence of haemochosis was higher in small ruminants 69.6% and 57.1% in sheep and goats respectively. This might due to fact that, the sheep usually graze very close to the soil which might be helpful in the acquisition of more infective larvae from the contaminated herbage and goats browse on shrubs and small trees where translation of infective larvae to such height seems impossible. The distribution of Haemonchosis was higher in young compare to adult shoats. It was also explained that low level of parasitism reported in the adult animals is due to the development of significant immunity with the course of time. In this finding, there was statistical significance ($p < 0.05$) between species, origin and age groups. The prevalence rate was higher in medium body condition than good body condition. This might be due to poor management system and poor immunological response to infective stage of the parasites.

Based on the above conclusion the following recommendations are forwarded:

- Segregations of small ruminants according to their age group should be practice to reduce the harboring of parasite by young sheep and goats.
- The strategic deworming of the parasite should be focus on small ruminants in spring at the beginning of the grazing period to prevent the contamination of the pasture and at the end of summer when the animals with high adult worms.
- An appropriate strategic control and prevention methods of haemonchosis parasite should be designed in young sheep and goat.
- Decreasing the stocking rate should be applied to decreases the number of worms spread on a pasture.
- Grazing sheep and goat in a rotation with cattle should be practiced in order to reduce internal parasite problems.

References

Abay, G., Tilaye, D., Amene, F. and Teshale, T. (2015): Sheep Infection by *Haemonchus* Species: Effect on Haematocrit and Evaluation of the FAMACHA Method in Arsi Negele District, Oromia, Ethiopia. *Ani. Vet. Sc.*, **3**: 74-79.

Abebe, R., Meberahtu, G., Solomon, M., Fufa, A. and Alemayehu, R. (2010): Gastrointestinal Nematode Infection in Small Ruminants under the Traditional Husbandry Systems during the Dry season in Southern Ethiopia. Pp. 1112-1117.

Achi, Y. L., Zinsstag, J., Yao, K., Yeo, N., Dorchies, P. and Jacquiet, P. (2003): Host specificity *Haemonchus* spp. for domestic ruminants in the savannah in northern Ivory Coast. *Vet. Paras*., **116**: 151-158.

Ragassa, A., Abebe, R., Gebreyohannes, M., Ekuria, M. S. and Abunna, F. (2006): Gastrointestinal nematode infections in small ruminants under the traditional husbandry system during the dry season in southern Ethiopia. *Trop. Ani. Heal. Prod*., **42**: 1111-1117.

Argaw, S., Desta, B. and Belay, A. (2014): Prevalence of abomasal nematodes in sheep and goats slaughtered at Haramaya municipal abattoir, eastern Hararghe, Ethiopia. *J. Bio. Agr. Heal*., **4**: 2224-3208.

Aumont, G., Gruner, L. and Hostache, G. (2003): Comparison of the resistance to sympatric and allopatric isolates of *Haemonchus contortus* of Black belly sheep in Guadeloupe (FWI) and of INRA 401 sheep in France. *Vet. Paras*., **116**: 139-150.

Badaso, T. and Addis, M. (2015): Small Ruminants Haemonchosis: Prevalence and Associated Risk Factors in Arsi Negelle Municipal Abattoir, Ethiopia. *Glob. Vet*., **15**: 315-320.

Badran, I. R., Abuamsha, R., Aref, W. and Alumor, J. (2012): Prevalence and Diversity of gastrointestinal parasites in small ruminants under two different rearing systems in Jenin district of Palestine. *J. Resea. Natur. Scie*., **26**: 1-18.

Bhat, S. A., Mir, M. R., Allaie, S. Q., Khan, H. M., Husain, I. and Ali, A. (2011): Comparative Resistance of Sheep Breeds to *Haemonchus Contortus* in Pasture Infection in Jammu and Kashmir. *Glob. Vet*., **8**: 222-228.

Bowman, D. D. (2003): Parasitology for Veterinary, 8th Edition Elsevier, New York, NY, USA. Pp. 1-432.

Chandrawathani, P (2004): Problems in the Control of Nematode Parasites of Small Ruminants in Malaysia: Resistance to Anthelmintics and the Biological Control Alternative. Doctoral thesis. Pp. 1-48.

Coop, R. L. and Kyriazakis, I. (2001): Influence of host nutrition on the development and consequences of nematode parasitism in ruminants. *Tren. Paras*., **17**: 325-330.

CSA, (2010): Central statistical Authority; Report on livestock and livestock characteristics. Addis Ababa, Ethiopia. Volume **2**.

Dagnachew, S., Amamute, A. and Temesgen, W. (2011): Epidemiology of gastrointestinal helminthiasis of small ruminants in selected sites of North Gondar zone, Northwest Ethiopia. Ethio. *Vet. J*., **15**: 57-68.

Eguale, T. (2005): In Vitro and In Vivo Evaluation of Anthelmintic Activities of Crude Extracts of Selected Medicinal Plants against *Haemonchus Contortus*. Pp. 1-71.

Enquebaher, K. and Etsay, K. (2010): Epidemiological study on mange mite, lice and sheep kids of small ruminants in tigray region, northern Ethiopia. *Ethio. Vet J*., **14**: 51-65.

ESGPIP. (2007): Body condition scoring of sheep and goats, *Technical Bulletin* No.**8**.

Fentahun, T. and Luke, G. (2012): Small Ruminant Haemonchosis: Prevalence and Associated Determinants in Randomly Selected Restaurants and Hotels of Gondar Town, Ethiopia. *Euro. J. Ap. Scie*., **4**: 168-172.

Gatongi, P. M., Prichard, R. K., Ranjan, S., Gathuma, J. M., Munyua, W. K., Cheruiyot, H. and Scott, M. E. (1998): Hypobiosis of *Haemonchus contortus* in natural infections of sheep and goats in a semi-arid area of Kenya. *Vet. Paras*., **77**: 49-61.

Githigia, S. M., Thamsborg, S. M., Munyua, W. K. and Maingi, N. (2001): Impact of gastro-intestinal helminthes on production in goats in Kenya. *Smal Rum. Res*., **42**: 21-29.

Harmon, A. F., Williams, Z. B., Zarlenga, D. S. and Hildreth, M. B. (2007): Real-time PCR for quantifying *Haemonchus contortus* eggs and potential limiting factors. *Paras. Resea*., **101**: 71-76.

Inaam, A. D., Tayeb, I. B., Shadad, S. A. and Hassan, T. (2007): The Effect of *Haemonchus contortus* infection and treatment with ivermectin on drug-metabolizing enzymes. *Resea. J. Ani. Vet. Scie*., **2**: 66-71.

Janina, D. (2005): The physiological site of action and the site of resistance to the macrocyclic lactone anthelmintics in sheep parasitic trichostrongyloid nematodes. Pp. 1-212.

Jemere, B., Tariku, M. and Abebe, R. (2011): External parasite infestations in small ruminants in Wolmera district of oromia region, central Ethiopia. *J Ani Vet Adv*., **10** (4): 518-523.

Jill, M. S. (2009): The Effects of Naturally Occurring Plant Products on Experimental *Haemonchus contortus* Infection in Gerbils and Sheep. Pp. 1-65.

Kumsa, B. and Wossene, A. (2006): Abomasal nematodes of small ruminant of Ogaden region Eastern Ethiopia: prevalence, worm burden and species composition. *Rev. Vet. Med*., **157**: 27-32.

Larsen, M. (2000): Prospects for controlling animal parasitic nematodes by predacious micro fungi. *Paras*., **120**: 121-131.

Lerato, T. M. (2012): Development of Molecular Diagnostic Methods (Lamp and PCR) for Detection of *Haemonchus Contortus*, *Fasciola* Spp and *Trichostrongylus* Spp Infections in Livestock. Pp. 1-78.

Maphosa, V., Masika, P. J., Bizimenyera, E. S. and Eloff, J. N. (2010): In-vitro anthelminthic activity of crude aqueous extracts of Aloe ferox, Leonotis leonurus and Elephantorrhiza elephantina against Haemonchus contortus. *Tro. Ani. Heal. Prod*., **42**: 301-307.

Margo, H. (2006): Managing Internal Parasites in Sheep and Goat. *NCAT*., **1**: 1-8.

Melese, A., Mohammed, T., Abebe, R., Aragaw, K. and Bekele, J. (2010): Survey of ixodid ticks in domestic ruminants in Bedelle district, Southwestern Ethiopia. *Trop. Ani Heal. Prod*., **42**: 1677-1683.

Mengist, Z., Abebe, N., Gugsa, G. and Kumar, N. (2014): Assessment of Small Ruminant Haemonchosis and Its Associated Risk Factors in and Around Finoteselam, Mekelle University, College of Veterinary Medicine, Ethiopia. *J. Agr.Vet. Scie*., **4**: 36-41.

Meselea, H., K/yohannesa, T. and Zegeye, S. (2013): Prevalence of haemonchosis in small ruminants in and around Woreda Alameta. *Rev. electr. vet*., **14** (4): 1-12.

Min, B. and Hart, S. (2003): Tannins for suppression of internal parasites. *J. Ani. Scie*., **81**: 102-109.

Min, B., Hart, D., Miller, G., Tomita, M., Loetz, E. and Sahlu, T. (2005): The effect of grazing forage containing condensed tannins on gastro-intestinal parasite infection and milk composition in Angora does. *Vet. Paras*., **130**: 105-113.

Miriam, C. (2009): Anthelmintic Resistance of *Haemonchus Contortus* and the FAMACHA Method as a Tool to Delay the Development of Anthelmintic Resistance. Pp. 1-100.

MOI. (2005): Export products of Ethiopia. Press release of Ministry of Information, department of press and audio visual Addis Abeba.

Mulugeta, T., Batu, G. and Bitew, B. (2011): Prevalence of Gastrointestinal Parasites of Sheep and Goats in and Around Bedelle, South-Western Ethiopia. *Inter J. Vet. Med*., **8**: 134-156.

Nahar, L., Sarder, M., Mondal, M., Faruque, O. and Rahman, M. (2015): Prevalence of Haemonchosis of Goats at Rajshahi District in Bangladesh. *Bangl. J. Vet. Med*., **13**: 29-36.

Nigussie, H. (2002): Prevalence of gastro intestinal helminthes of small ruminants in and Around Wolayita sodo, Southern Ethiopia. Pp. 1-35.

NWosu, C. O., Madu, P. P. and Richards, W. S. (2007): Prevalence and seasonal changes in the population of gastro intestinal nematodes of small ruminants in the semi arid zones of north-eastern. *Niger.vet. paras*., **144**: 118-124.

O'Connor, L. J., Walkden-Brown, S. W. and Kahn, L. P. (2006): Ecology of the free-living stages of major trichostrongylid parasites of sheep. *Vet. Paras*., **142**: 1-15.

Odoi, A., Gathuma, J. M., Gachuiri, C. K. and Omore, A. (2007): Risk factors of gastrointestinal nematode parasite infections in small ruminants kept in smallholder mixed farms in Kenya. *Vet. Resea*., **3**: 6.

Seth, B. (2014): A Review of the Epidemiology of Gastrointestinal Nematode Infections in Sheep and Goats in Ghana. *J. Agri. Scie*., **6**: 1916-9760.

Shaik, S., Terril, T., Miller, J., Kauakou, B., Kannan, G. and Kallu, R. (2004): Effects of feeding sericea lespedeza hay to goats infected with *Haemonchus contortus. S. Afr. J. Ani. Scie*., **34**: 248-250.

Shankute, G., Basaznew, B. and Achenef, M. (2013): An abattoir survey on gastrointestinal nematodes in sheep and goats in hemex export. *J. Adv. Vet. Resea.*, **3**: 60-63.

Sheferaw, D., Degefu, H. and Banteyirgu, D. (2010): Epidemiological study of small ruminant mange mites in three agro-ecological zones of Wolaita, Southern Ethiopia. *Ethio. Vet. J.*, **14**: 31-38.

Stear, M. J., Doligalska, M. and Donskow, S. K. (2007): Alternatives to anthelmintics for the control of nematodes in livestock. *Paras*., **134**: 139-151.

Strain, S. A. and Stear, M. J. (2001): The influence of protein supplementation on the immune response to *Haemonchus contortus. Paras. Immuno*., **23**: 523-531.

Taylor, M. A., Coop, R. L. and Wall, R. L. (2007): Veterinary Parasitology. 3rd Ed. Oxford. UK. Blackwell Publishing. Pp. 1-356.

Tehrani, A., Javad, J., Meysam, J., Farhang, S., Amirali, S., Mojtaba, R., Farshid, K., Hamid, A. and Mohammadreza, M. (2012): Histopathological Study of *Haemonchus contortus* in Herrik Sheep Abomasum. *Bacter. Paras., J.*, **3**: 342-367.

Thrusfield, M. (2005): Veterinary epidemiology. 3rd ed. Black well Science, Singapore. Pp. 1-233.

Tilahun, G., Dorchies, P. and Jacquiet, P. (2007): Trends and Challenges in the Effective and Sustainable Control of *Haemonchus Contortus* Infection in Sheep. *Paras*., **14**: 3-14.

Tyrell, K., Sally, W., Ray, M., Ikechukwu, E. and Eric, P. (2008): The Use of Tanniferous Plants to Control Infestations of *Haemonchus contortus* Parasites in Meat Goats. Pp. 1-6.

Urquhart, G. M., Armour, J, Duncan, J. L., Dunn, A. M. and Jennings, F. W. (1996): Veterinary Parasitology. 2nd ed. Blackwell Science. Pp. 19-164.

Urquhart, G. M., Armour, J., Duncan, A. M. and Junnings, F. W. (2001): Veterinary parasitology. 2nd ed. Black well science, Scotland. Pp. 39-58.

Vatta, A. F. and Lindberg, A. L. (2006): Managing anthelmintic resistance in small ruminant livestock of resource-poor farmers in South Africa. *Tydskr. S. Afr. vet. Ver*., **77**: 2-8.

Vatta, A. F., Abbot, M. A., Villiers, J. F., Gumede, S. A., Harrison, L. J., Krecek, R. C., Letty, B. A., Mapeyi, N. and Pearson, R. A. (2006): Goat Keepers' Animal Health Care Manual. Agricultural Research Council, South Africa. Pp. 60.

Waller, P. J. (2004): Management and control of nematode parasites of small ruminants in the face of total anthelmintic failure. *Trop. Biomed*., **21**: 7-13.

Waller, P. J., Bernes, G., Rudby, M. L., Ljungstrom, B. L. and Rydzik, A. (2004): The epidemiology of abomasal nematodes of sheep in Sweden, with particular reference to over-winter experimentally infected with *Haemonchus contortus*. *Vet. Paras*., **113**: 253-261.

Wells, A. (2005): Sustainable Management of Internal Parasites in Ruminants. *Prod. Al*., **6**: 20-23.

Wossene, A. and Gelaye, E. (2001): Survey of ovine and caprine gastrointestinal helminthosis in eastern parts of Ethiopia during the dry season of the year. *Rev. de. med. vet*., **152**: 379-384.

Zajac, A. M. (2006): Gastrointestinal nematodes of small ruminants: life cycle, anthelmintics, and diagnosis. *Vet. Clin. Nor. Am. F.Anim. Pract*., **22**: 529-541.

Access this Article in Online	
	Website: www.ijarm.com
Quick Response Code	Subject: Veterinary Medicine
DOI:10.22192/ijamr.2017.04.03.004	

How to cite this article:
Belete Abdo, Wale Tesfaye, Adisu Agaro, Bizuayehu Eshetu and Kero Mekuria. (2017). Prevalence and associated risk factors of small ruminants haemonchosis in Debra-Zeit Elfora export Abattor, Beshoftu town, Ethiopia. Int. J. Adv. Multidiscip. Res. 4(3): 30-42.
DOI: http://dx.doi.org/10.22192/ijamr.2017.04.03.004