SEASONAL PREVALENCE OF GASTRO-INTESTINAL HELMINTH PARASITES OF GOATS (*Capra* sp.) OF SHIVRAJ MUNICPALITY-13 KAPILVASTU, NEPAL

RABINDRA PRASAD TRIPATHI

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T.U. Exam Roll No:-18308

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Submitted to

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Tribhuvan University

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Nepal

October, 2015

DECLARATION

I hereby declare that the work presented in this thesis has been done myself and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by references to the authors or institution.

Date:-……October 2015

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Rabindra Prasad Tripathi

RECOMMENDATION

This is to recommend that the thesis entitled "SEASONAL PREVALENCE OF GASTRO-INTESTINAL HELMINTH PARASITES OF GOATS (*Capra* sp.) OF SHIVRAJ MUNICPALITY-13 KAPILVASTU, NEPAL has been carried out by Rabindra Prasad Tripathi for the partial fulfillment of Master's Degree of science in zoology with special paper **parasitology.** This is his original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date……October 2015

……

Supervisor

Mr. Janak Raj Subedi

Lecturer

Central Department of Zoology

Tribhuvan University Kirtipur,

Kathmandu,Nepal

LETTER OF APPROVAL

On the recommendation of supervisor "Mr. Janak Raj Subedi this dissertation of Mr. Rabindra Prasad Tripathi entiled "SEASONAL PREVALENCE OF GASTRO-INTESTINAL HELMINTH PARASITES OF GOATS (*Capra* sp.) OF SHIVRAJ MUNICPALITY-13 KAPILVASTU, NEPAL is approved for examination and is submitted to the Tribhuvan University in partial fulfillment of the requirements for Master's degree of science in zoology **(Parasitology).**

Date…….October 2015

…….

Prof. Dr. Ranjana Gupta

Head of Department

Central Department Zoology,

Tribhuvan University Kirtipur,

Kathmandu,Nepal.

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Rabindra Prasad Tripathi entitled "SEASONAL PREVALENCE OF GASTRO-INTESTINAL HELMINTH PARASITES OF GOATS (*Capra* sp.) OF SHIVRAJ MUNICPALITY-13 KAPILVASTU, NEPAL" has been accepted as a partial fulfillment for the requirements of Master's Degree of science in zoology with special paper Parasitology.

EVALUATION COMMITTEE

……	……
Supervisor	Head of Department
Mr. Janak Raj Subedi	Prof. Dr. Ranjana Gupta
Lecturer	Central Department of Zoology
Central Department of Zoology	Tribhuvan University Kirtipur,
Tribhuvan University Kirtipur,	Kathmandu, Nepal
Kathmandu, Nepal	
……..	……
External examiner	Internal examiner

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Regd no:-5-3-28-136-2009

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CONTENTS

	Page No.
Declaration	i
Recommendation	ii
Letter of Approval	iii
Certificate of Acceptance	iv
ACKNOWLEDGEMENT	v
LIST OF ABBREVIATIONS	x
LIST OF TABLES	x
List of Figures	xi
LIST OF MAP	xi
LIST OF PHOTOGRAPHS	xii
ABSTRACT	xiii
1. INTRODUCTION	1-6
1.1. Background	1
1.2. Goat product and use	2
1.3. Significance of study	5
1.4. Limitation of study	6
OBJECTIVES	
1.5. General objective	6
1.6 Specific objective	6

2. LITERATURE REVIEW 7-17

2.1. In Global context 8

2.2. Literature review in context to Nepal 14

3. MATERIALS AND METHODS 18-23

3.1. Study area 18

3.2. Study design 20

3.3. Study period 20

3.4. Sample size 20

3.5. Precautions and preservation 20

3.6. Equipments and materials 21

3.7. Chemicals 21

3.8. Stools examination 22

3.8. A. Floatation technique 22

3.8. B. Sedimentation technique 22

3.8. C. Stool counting method 23

3.9. Key for trematodes, cestodes and nematodes 23

4. RESULTS 24-46

4.1. General prevalence of helminthes parasites 24

4.2. Class-wise seasonal prevalence. 25

4.3. Seasonal prevalence of cestodes, trematodes and nematodes 26-29

4.4. Identification of eggs of helminthes 30-41

Eggs of *Dicrocolium* sp. 30

Eggs of *Fasciola* sp. 31

Eggs of *Paramphistomum* sp. 31

Eggs of *Moniezia* sp. 32

Eggs of *Taenia* sp. 32

Eggs of *Haemonchus* sp. 33

Eggs of *Strongyloides* sp. 33

Eggs of *Trichostrongylus* sp. 34

Eggs of *Chabertia* sp. 35

Eggs of *Oesphagostmum* sp. 35

Eggs of *Trichuris* sp. 36

Eggs of *Capillaria* sp. 36

Eggs of *Dictyocaulus* sp. 37

Eggs of *Toxocara* sp. 38

Eggs of *Cooperia* sp. 38

Eggs of *Osteriagia* sp. 39

Eggs of *Bunostomum* sp. 40

Eggs of *Nematodirus* sp. 40

Eggs of *Strongyl* sp. 41

4.5 Intensity of infections 42

4.6 Multiple infections 43

5. DISCUSSION 47-49

5.1. Discussion

6. CONCLUSION AND RECOMMENDATIONS 50-51

6.1. Conclusion 50

6.2. Recommendation 51

REFERENCES

LIST OF ABBREVIATIONS

ADPCD- Animal Disease and Parasite Control Division

CBS-Central Bureau of Statistics

CDZ-Central Department of zoology

CVH- Central Veterinary Hospital

DLSO-District Livestock Service Office

FAO- Food and Agriculture Organization

GDP-Gross Domestic Production

VEC- Veterinary Epidemiology Center

WHO- World Health Organization

T.U-Tribhuvan University

MAOC-Ministry of Agriculture and Cooperative

GI- Gastro-Intestinal

MOAC-Ministry of Agriculture and Cooperative

LIST OF TABLES

1. Observed genera of different classes with prevalence percentage 25

2. Prevalence of nematodes during summer 29

3. Prevalence of nematodes during winter 29

4. Intensity of infection during summer 42

5. Intensity of Infection in winter 43

List of Figures

Fig1 General prevalence of helminth parasites 24

Fig2 Seasonal prevalence of helminthes 26

Fig3 Seasonal prevalence of trematodes of goat 27

Fig4 Seasonal prevalence of cestodes of goat 28

LIST OF MAP 19

Maps of Kapilvastu District 19

LIST OF PHOTOGRAPHS 44-47

1Eggs of *Fasciola* sp.

2Eggs of *Paramphistomum* sp.

3 Eggs of *Moniezia* sp.

4 Eggs of *Taenia* sp.

5Eggs of *Haemonchus* sp.

6Eggs of *Strongyloides* sp.

7Eggs of *Trichostrongylus* sp.

8Eggs of *Chabertia* sp.

9Eggs of *Oesphagostmum* sp.

10Eggs of *Trichuris* sp.

11Eggs of *Capillaria* sp.

12Eggs of *Dictyocaulus* sp.

13 Eggs of *Toxocara* sp.

14 Eggs of *Cooperia* sp.

15 Eggs of *Osteriagia* sp.

16 Eggs of *Bunostomum* sp.

17 Eggs of *Nematodirus* sp.

18 Eggs of *Strongyl* sp.

19 Eggs of *Dicrocoelium* sp.

20. Microscopic observation of feacal samples 47

ABSTRACT

Goat (*Capra* sp.), being an important source of meat in Nepal. This species is greatly affected by the helminthes parasites. The current study was carried out to observe the seasonal prevalence of intestinal parasites with sedimentation and flotation techniques. The samples were collected and examined for the study periods. The overall prevalence of helminth parasite during winter, 58 (54.71%) infection and summer 86 (81.13%) infection. Winter 13(12.26%) infection were caused by trematodes, 7 (6.66%) by cestodes and 38 (35.84%) nematodes. Summer 19(17.92%) infection were caused by trematodes 11 (10.37%) by cestodes and 56(52.83%) nematodes. The prevalence percentage of identified genera of trematodes were *Dicrocoelium* sp. (3.47%), *Fasciola* sp. (15.97%) and *Paramphistomum* sp. (2.77%). The difference in the prevalence of different genera of trematodes during winter and summer were not found statistically insignificant ($\chi 2$= 1.325, p 0.250). Among cestodes the genera identified with their prevalence percentage were found to be *Moniezia* sp. (2.77%) and *Taenia* sp. (9.72%). The difference in the prevalence of different genera of cestodes during winter and summer were not found statistically insignificant ($\chi 2$= 2.186, p 0.139).

Similarly the genera included in nematodes are *Toxocara* sp. (16.66%), *Strongyl* sp. (1.38%), *Bunostomum*(2.77%),*Capillaria*(4.86%),*Chabertia*(4.16%),*Dictyocalus*(4.86%), *Cooperia(2.08%),Heamonchus(3.47%),Oesophagostomum(8.33%),Nematodirus(0.69%),Ostertagia(1.38%),Strongyloides(6.25%),Trichuris(5.55.%),Trichostrongylus(4.86%).* Mixed infection was observed in 54 (50.94%) winter and 80(75.47%) summer season. Altogether 134 (63.20%) mixed infection were detected. The difference in the prevalence of helminth parasites during winter and summer seasons were found statistically significant ($\chi 2$=6.193, P<0.013, d. f. = 1)

Key:-Helminth, Trematodes, Cestodes, Nematodes, Parasite, Prevalence, Sedimentation, Flotation.

CHAPTER – I

INTRODUCTION

1.1Background

Goat (*Capra* sp.) is one of the important domestic livestock as a source of dairy, meat and manure. It is a herbivious animal and widely distributed in all over the worlds. It is one of the oldest domesticated species. It belongs to family bovine and subfamily caprinae. Goats are primarily reared for meat and manure and regarded as the second important animal species (first being buffalo) for generating their cash income by farmers.

Meat and meat products originating from all domestic animals except cattle are consumed in Nepal. Animal slaughter is a common practice not only for consumption but also for religious sacrifices and traditional ceremonies.

Meat production in Nepal is largely based on small holder subsistence production system except for some recently developed units of commercial poultry in few pockets of the country. Among the farm livestock reared by the farmers in Nepal, goats are reared for the output to contribute for meat supply.

It has life span of about 8-15 years and weight about 30-60 kg. Gestation length is approximately 145-155 days. Twins are the usual result with single and tripled births are also common. The mother often eats the placenta. The national production is unable to fulfill the need of Nepal, hence significance number of goats are imported from neighboring countries. About 74% of goats are brought from India and 26% from different parts of Nepal in the Kathmandu market (3rd NASc Conv., 19

Livestock farming is an integral part of the farming system and goats contributes substantially in the livestock sector of Nepal. Goat, in Nepal has been acclimatized and adopted to a wide range of environmental conditions. It can maintain itself in a harsh environment (Devendra et al).

1.2. Goat products and uses

It is regarded as a very beneficial animal for thousands of year they have been utilized for their meat, milk, hair, and skins all over the world in the last century they have also gained some popularity as pets. A goat is said to be truly useful both alive and dead.

a. Milk and cheese

Goat's milk is more easily digested then cow's milk and is recommended for infants and people who have difficulty with cow's milk. Goat milk is also used to make popular cheese as Rocamadour and feta, although it can be used to make any type of cheese. The curd is much smaller and more digestable.

b. Skin

Goat skin is still used today to make gloves, boots, and other products that require a soft hide.

c. Meat

Meat production in Nepal is largely based on small holder subsistence production system except for some recently developed unit commercial goat form in few pockets of the country. The goat meat is called chevon. It also has more mineral than chicken, and is lower in saturated fats than other meat. Other parts of the goat including organs are also equally edible. Special delicacies include the brain and liver.

d. Fiber

Cashmere goats produce a fiber, cashmere wool, (sheep) which is one the best in the world. Cashmere fiber is very fine and soft and grows beneath the guard hairs. The fiber is made into products such as sweaters and a dolls hair with the mohair. In South Asia, Cashmere is called pashmina and these goats are called pashmina goats.

e. In farming

Small ruminants mainly goats are essential components of the mixed farming system in the hills of Nepal and are found in all parts of the country. They are mainly kept for meat, although wool (sheep, fiber (goat) and manure are also important products from these

animals. The present subsistence farming systems of the hills, farmers have little surplus agricultural products to sell and so depend upon the sale of livestock and their products as a source of income. However, because of their inherent ability of utilize mountain terrain, unstable for crop forming, a high proportion of sheep and goats are found in the hills.

Nepal is a landlocked country where 76%of the people depend on agricultural activities in 2011.The population of goat and meat production is estimated to be 6.6 million and 0.4 metric ton respectively. The Ministry of Agriculture and Cooperative (MOAC 2002) contributed 19.4% to the total meat production of the country. Nepal produced 42,320 metric tons goat meat in the year 2006. (VEC: National Report 2006) and the annual production of meat per household was 51.54 Kg in the year 2006.

Goats are relatively resistant to many diseases compared to the livestock species. At present internal parasites, Peste des, Petits Ruminants (PPR) and Contagious Caprine Pluro-Pneumonia (CCPP) are the diseases that can be major threats in unmanaged farming systems. Among different parasitic infections helminth diseases are most varied and of common occurrence. Different grades of infections with fluke, tapeworms and roundworms, are responsible for marked deleterious effect that tend to lower overall production both by the way of morbidity and mortality. Gastro –intestinal parasitic diseases are regarded as the most important constraint to reduce the productivity of sheep and goats in Nepal.

Endoparasites are those organisms living within their hosts, in the gut, body cavity, liver, lungs, gallbladder and blood or within the intestinal cavities, tissues, or cell of the host such forms nearly always live a completely parasitic. Since they totally depend upon their host, endo parasitism is also reffered to as infection. *Fasciola* sp. *Trichostrongylus* sp., *Schistosoma* sp., for examples were typical endoparasite. Infection with gastro-intestinal nematodes is regarded as one of the important factor causing productivity loss (Shrestha 1994). The most important and widely prevalent nematodes are *Haemonchus, Trichostrongylus, Cooperia, Nematodirus,* and *Bunostomum*. These nematodes in the small intestine may cause severe damage to the intestinal mucous membrane. *Toxocara* sp. *Dictyocaulus* sp. (filarial nematodes) has the worldwide distribution and the prevelence in higher in cattle and buffaloes (Karki 2005).

Cestodes found in gut and acquired by eating contaminated food or water found to be largely affecting the ruminants. This group comprises the genera *Moniezia* which are cosmopolitan is distribution and *Taenia* which are commonly found in the rumen of the domesticated and wild carnivorous. They have reported from Asia and Africa (Karki 2005).

Moniezia sp in ruminants of the goats and cattle causes infections by ingesting herbage contaminated with the mites carrying the infective stage of the parasites, Heavy infection cause poor growth and diarrhea in lambs.

Taenia saginata usually called cow or buffalo tapeworm has two hosts viz. definitive host man and intermediate host cow or cattle.

Trematode*s* commonly known as flukes, often live in the bile duct or small intestine and may also affect the lungs. Their eggs are passed with the faeces of the host. Some are ingested but some burrow in the skin after hatching for access. Trematode especially includes *Fasciola* sp., *Dicrocoelium* sp., And *Schistosoma* sp., species. (Shah and Agrawal 1990)

Fascioliasis is a well known parasitic infection of herbivorous animals. It has worldwide distribution of the animal reservoir host. The different names of this disease such as namle, mate, lew etc in different regions are the proof of its continued existance for many years in the animal population of the country. Infection of *Fasciola sp* causes significant loss estimated at over USȘ 2000 million per annum to the agriculture sector worldwide with over 600 million animals affectd (Boray 1985). The economic loss due to fascioliasis in Nepal was estimated to be Rs. 14.2 corer (Lohani and Rasaili 1995). Infection of the human host was very sporadic until the last two decades when clinical cases and outbreaks were reported. It has now become an important emerging food borne trematodes concern (Chen and Mott 1990). The largest numbers of infected people have been reported in Bolivia, China Ecuador, Egypt, France, Islamic republic of Iran, Peru and Portugal (WHO 1995).

The pathogenic effect of gastrointestinal parasites may be sub clinical or clinical. Young animals are most susceptible. The effect of these parasites is strongly dependent on the number of parasites and nutritional status of the animal they are infecting. The clinical sign comprise of weight loss, reduced feed intake, Diarrhea and reduced yield. Severe blood and protein loss into abomasums and intestine due to damage caused by the parasite often results

in oedema in the sub-mandibular region. Some nematode species especially *Haemonchus* is most pathogenic among blood suckers and infections with large number of this parasite often results in severe anemia in the host. Blood loss from *Bunostomum* sp and *Oesophagostomum* infections may add to the severity of the anemia. Infections with gastro intestinal nematodes usually occur by the ingestion of eggs by the young kids. These nematodes damage the mucous membrane of the small intestine, migrating larvae may causes damage to the liver and lungs and causes severe anemia and diarrhea to the host. Mixed infections with gastro-intestinal nematodes are very common.

Trichostrongyliasis is diseased stage of the gastro-intestinal tract of herbivorous animals and man is an accidental host only. This disease is caused by the members of the germs *Trichostrongylus* sp the infection is acquired by the infection of contaminated vegetables or drinks with its third stages larvae Strongyloidiasis is an intestinal infection of man caused by the penetration of the skin by the filariform larvae of *Strongyloides stercoralis*. Toxocariasis in human is widely distributed throughout the world, in both temperate and tropical countries. Man acquires infection accidently by the ingestion of the larvae of this nematode the inadequately cooked food of paratenic host.

1.3. Significance of study

There is insufficient information to the people, describing the pathogenecity of helminth parasites of livestock in different parts of world. Public and butchers are not aware of the meat borne diseases and zoonotic diseases. The infection of helminth parasites in goats can cause significant economic loss leading to the poor health reduced growth, mortality of kids etc. This study is an effort to determine the seasonal prevalence of helminth parasite in goats and the rate of infection in them.

Nepal, being a developing country depends on agriculture and animal husbandry for its bulk of economy. The goat farming is also poor and unhygienic manner and hence is heavily infected with different parasites including helminth parasites. In these circumstances this type of study can play a vital role. The present study dominated the prevalence of helminth parasites during summer and winter.

This study will also form a base for the future researchers and investigators, those working of livestock. Thus the study has got a great important and significant in itself.

1.4. Limitation of study

This study was carried out to determine the prevalence of helminth parasites seasonally but the study doesn't reveal why some parasites were predominant and other were not. This study is limited only determine the prevalence of parasites by coprological study.

Identification of parasites were done up to genus level only.

OBJECTIVES

1.5 **Objectives**

a. **General objective**:-

-To determine the prevalence of intestinal helminth parasites of goat (*Capra* sp.) in Shivraj Municpality -13 of Kapilvastu, Lumbini, Nepal.

b. **Specific objectives**:-

-To identify the eggs of helminth parasites in goat fecal material.

-To determine the seasonal prevalence of trematodes, cestodes and nematodes in goats brought for slaughter purpose.

-To develop the recommendations for the planning to control of helminth parasites in goat.

CHAPTER-II

LITERATURE REVIEW

Rudolf Leuckart was considered the father of parasitology as well as one of the most famous Zoologist of the 19th century. In the field of parasitology, his studies of the liver fluke, *Taenia*

and of *Trichinaella spiralis* were highly significant. His work with parasitism infections proved that *Taenia saginata* occurs only in cattle and that *T. solium* occurs only in pigs.

Goat (*Capra* sp.) is an important domestic animals, it is a herbivious animals and widely distributed in all over the worlds. It is a member of the bovine family and subfamily caprinae is one of the oldest domesticated species it is regarded as a very beneficial animal for thousand of year, they have been utilized for their milk, meat, hair, and skins all over the world.

An organism which obtains food or shelter from another organism (host) inhabiting in or on the body of the host providing nothing in return but always harmed. Generally the parasite is smaller than the host e. g. Louse, Round worm, Hook worm, Mosquito etc.

Parasitic zoonoses are distributed world- wide and constitute an important group of disease affecting both the human and animals. Many of the parasitic zoonoses produce significant mortality and morbidity in the human and are responsible for the major economic loss by affecting the animal health. Most of the papers have been presented and published largely after the outbreak of helminthic diseases among human and animals. threats. Major research efforts that have been directed towards helminth parasites, the portions of the work and reports related to the epidemiology of helminth parasite have been mentioned here. Literatures exist in helminth parasites as the diseases continued to survive with new threats. Major research efforts that have been directed towards helminth parasites, the portions of the work and reports related to the epidemiology of helminth parasite have been mentioned here.

2.1 In Global context

Jithendran and Krishna (1990) conducted a study on prevalence of helminthiasis in small ruminants in Palampur (Himachal Pradesh, India). Faecal examination of 325 goats was done and 93% goats were found to be infected with *Strongyloides* and species of *Fasciola*.

Nado et al. (1991) conducted an epidemiological survey on gastrointestinal helminth in 51 sheep and 51 goats on Senegal from October 1990 to September 1991. All the animals

examined were infected with at least one helminth species. Three trematodes (*Fasciola gigantic, Schistosoma* bovis, *Amphistomum* sp.), 2 Cestodes (*Moniezia expansa*, *Cysticercus tenuicollis*) and 9 nematodes were identified. The most important parasites in goat were *Trichostrongylus* colubriformis, while *Haemonchus* contortus in sheep.

Jithendran (1996) examined the status of helminth parasites in goats and sheep in palampur (Himanchal pardesh) by using standard coprologic parasitological procedure and recorded the prevalence of predominant nematode species of *Strongyloides, Trichostrongylus, Haemonchus*, and *Oesophagostomum, Fasciola, Dicrocoelium* and *Schistosoma* among the trematodes and *Moniezia* among the cestodes.

Pathak et al. (2000) collected 88 gastrointestinal tracts of goats from the slaughter house Supela, bhilai and were also collected from the veterinary collage, of durg district chhattishgarh and were brought for the postmortem examination during November 1999 to October 2000. The percentage of overall parasitic infection were *Paramphistomum* spp; *Cotylophoron* spp; *Moniezia* spp*; Avitellina* spp; *Haemonchus* spp; *Cooperia* spp*; Oeshphagostomum* spp*; Bunostomum* spp; and *Trichuris* spp; were 80.68, 45, 45, 17.04, 3.40, 26.13 ,5.68, 3.40, 30.68, 5.68, and 27.27 respectively. In case of *Paramphistomum,* infection was the highest in monsoon (91.8%) and lowest in winter (63.15). In present investigations the seasonal prevalence of gastrointestinal parasitic infection in goat showed that prevalence was highest in monsoon (94.60%) moderate in summer (87.50%) and lowest in winter (63.15%).

Silvestre et al. (2000) studied the relationship between helminth species diversity, intensity of infection and breeding management in dairy goat farms of south Western France. A total of 17 helminths, among which 14 nematodes, one cestode *(Moniezia* sp) and two trematodes *(Paramphistomum and Dicrocoelium*) were recorded in the 26 necropsied called goats during the study.

Jithendran et al. (2001) studied the prevalence of gastrointestinal parasites in sheep and goats of Himachal Pradesh, India and found the prevalence in sheep and goats respectively as follows; *Fasciola* 9.6%, 8.8%; Amphistomes 3.8%, 2.5% *Dicrocoelium* 7.2% , 2.5% ,

Schistosoma 1.2%, 0.6%; *Moniezia* 2.7%, 1.3% *Strongyles* 91.6%, 100%; *Strongyloides* 4.8%, 5.1%; *Dictyocaulus* 1.2%, 1.3%; and *Trichuris* 14.3%, 1.3%.

Sharkhuu (2001) performed the postmortem examination of 236 goats from all provinces in Mongolia for the study of helminth in goats. Thirty-nine helminth species belonging to three classes, 14 families and 23 genera were found. The prevalence and intensity of helminth infection were reported for the three age groups of goats in four seasons and three geographic zones in Mongolia .Common helminth infections of goats in all zones of Mongolia were infection of *Ostertagia, Marshallagia* and nematodes. The highest number of eggs per gram (EPG) of feaces was counted in March (average 1335.3+405.3) and the lowest count was in November (54+18.6).

Mondal et al. (2002) conducted a study of gastrointestinal helminth in livestock grazing is grassland of Bangladesh. They released two cow calves and two goats in a grassland used for commonal grazing of livestock. After slaughtering of the tracer animals, their gastrointestinal examination revealed six species of nematode and one cestode. The nematode species were *Haemonchus contortus*, *Trichostrongylus axei*, *Mecistocirrus digitaus*, *Oesophagotomum* sp, *Trichuris* sp, and *Bunostmum* sp. the cestod*e* one of the genus *Moniezia*. With this study, grasslands are thought to be one of the main sources of gastrointestinal parasitic diseases of livestock in Bangladesh.

Wanjala et al. (2002) conducted a research on prevalence of parasitic infections in small ruminants in a post oral community in Narok district, Kenya. The investigation was done in 150 sheep and 150 goats during wet season (May-June) and dry season (August –September) and findings showed that 52% of the animals were infected. The most prevalent genera of helminth identified were *Strongyle* group.

Woldemariam (2003) conducted a study on lamb and 53 kid tracers during different seasons in the Mid-Rift valley of Ethipoia. In this study, the predominant worms recovered from 57 lambs were *Haemonchus* contortus (91-100%) and *Tricostrongylus* columbriformis (90-100%), followed by *Oesophgostomum columbianum* (33-83%) and *Trichuris ovis* (8-33%). Similarly, *Haemonchus* contrortus (95-100%) and *Trichostrongylus colubriformis* (83-100%) were predominant in the 53 kid tracers, followed by *Oesophagostomum* columbanium (58-

83%) and *Trichuris* ovais (41-74%). A significant different in eggs count was observed within seasons and sites.

Bashir and Love (2003) conducted a study on intestinal parasites in sheep and goats in Australia. In this study, *Haemonchus* sp, *Trichostrongylus* sp. and *Ostertagia* sp. Were predominant helminth parasites.

Regasa et al. (2004) were conducted a study on epidemiology of gastrointestinal parasites of ruminants in western Oromia, Ethiopia. This study showed that the overall prevalence of gastrointestinal parasites were 84.1% in goats. Nematodes of group *strongyle* and *eimeria* were the most prevalent parasites encountered in this area.

Yadav et al. (2005) reported the highest incidene of gastro-intestinal nematodiasis in goats followed by buffalo and cattle in India. *Haemonchus, Trichostrongylus, Bunostomum, Oesophagostomum* and *Strongyloides* species were the main parasites recovered from the intestine of sheep, goats and buffaloes.

Waruiru et al. (2005) conducted a study on gastrointestinal parasites infections of sheep and goats in semi –arid area of Machakos district, Kenya. The overall prevalence were *Strongyloides* (51.6%), *Fasciola* sp (31.5%) *Coccidia* (28.0%) *Moenizia* sp (2.5%) *Hamemonchus* (58.0%) was the most prevalent nematode followed by *Trichostrongylus* (29.0%) and *Oesophagostomum*(13%).

Opara et al. (2005) conducted a study on occurrence of parasitic helminth among small ruminants reared under traditional husbandry system in Owerri, south east Nigeria. In this study, out of 2,550 small ruminants examined 71.4% percent were goats which have helminth infection rates of 90.1percent. Nematode infection was consistently high and gave infection rate of 78.4 percent, while Trematodes and Cestods were recorded 13 percent and 8.7 percent respectively. Among Trematodes, *Paramphistomum* infection is 86.7%, among nematodes *Strongyloides* 62.2% and among Cestodes, *Moniezia* 50% were the highest.

Di Gebro et al. (2006) carried out a survey of parasites in goat farms in Bergamo province, north Italy from May 2005 to Jan, 2006. Fecal samples of 836 adult female goats from 31 dairy goat farms were examined. *Strongyloides* sp. Showed higher value of prevalence in

goats housed in summer while *Nematodirus* sp. in winter in goats at pasture. *Strongyloides* sp. occurred more frequently in autumn in stabled goats.

Lima et al. (2006) studied the faecal samples collected from 20 goats in Paulista, Pernambuco, Brazil, from August 1998 to July 1999. They were subjected to eggs per gram faeces (EPG) determination and nematode larvae culture. It was shown that 82% of the samples were positive for helminth. *Strongyloides, Moniezia* and *Trichuris* sp. Ova were obtained in 72.8%, 8.4% and 2.0% of the samples, respectively, while third stage larvae of *Haemonchus, Trichostrongylus* and *Oesophagostomum* sp. were obtained from 75.13, 24.32 and 0.54% of the samples, respectively. The medium number of *Haemonchus* and *Trichostrongylus* sp. larvae per gram faeces was higher in the rainy months. There was a significant correlation between EPG and the number of *Haemonchus* sp. larvae per gram faeces. *Haemonchus* sp. was present throughout the study period.

Mungube et al. (2006) estimated the prevalence and economic losses caused by *F. gingantica* and *F. hepatica* in the ruminant production system of Taveta division of Kenya in a retrospective appraisal of the slaughter records on the total number of animals slaughtered and livers condemned over the period 1989 to 2004.liver condemnation rates differed significantly between bovines, caprines and ovaines (p <_0.05) for *F.* gigantica (26%,6.6% and 5.2%respectively) and for F. hepatica (0.4%,22%, and 28% respectively).The total loss through condemnation of both *F.* gigantica and *F. hepatica* infested livers was 4408272 KES (Kenyan shillings) (US$ 72 272). The proportion of loss in bovines, caprines and ovines was 76%, 17% and 7% respectively.

Regassa et al. (2006) conducted a study to determine the prevalence and risk factors associated with gastrointestinal parasitism in western Oromia, Ethiopia during 2003-2004.A total of 757 ruminants (257 cattle, 255sheep and 245 goats) were included in the study using standard coprological parasitological procedure. The study showed that the overall prevalence of gastrointestinal parasites was 69.6% with 50.2%, 75.3%, and 84.1% in cattle, sheep and goats respectively. *Strongyles* and *Eimeria* were the most prevalent parasites encountered in the area. Season and age were shown to have association with prevalence but

not EPG while no association was revealed between prevalence and EPG with sex and body condition of the animal.

Rehman et al. (2006) assessed the month–wise prevalence of gastrointestinal trematodes, nematodes, and cestodes in Damani sheep and goat in Pakistan. A total of 96 positive gastrointestinal tracts (48 each) of sheep and goats were examined. trematode infection was 16.66 % both in sheep and goats in May, whereas in June, and July in goats which dropped to 8.33% in August. Highest custodial infections in sheep and goats were recorded in June (33.33%) and August (41.16%) respectively. The lowest recorded nematodal infections in sheep were observed in June (41.66%), which increased in July (50%), May (58.33%) and August (58.33%). In goats the lowest records were observed in June (41.66%) with an equal increase in May and August (i.e.50%).

Menkir (2007) carried out a two year epidemiology study of helminth of small ruminants. The study involved the collection of viscera from 655 sheep and 632 goats from 4 abattoirs in eastern Ethiopia. A further more detailed epidemiology study of gastrointestinal nematode infections used the Haramaya University (HU) flock of 60 Black Head Ogaden sheep. The parasitological data included numbers of nematode eggs per gram of faeces (EPG), faecal culture L3 larvae, packed red cell volume (PVC), adult worms and early L4 counts, and FAMACHA eye– colour score estimates, along with animal performance (Body weight change). There were 13 species of nematodes and 4 species of flukes present in the sheep and goat, with *Haemonchus contortus* being the most prevalent (65-80%), followed by *Trichostrongylus* spp. The nematode infection levels of both sheep and goat followed the bi-modal annual rainfall pattern, with the highest worm burdens occurring during the two rain seasons (peaks in May and September).

Odoi et al. (2007) investigation the burden and risk factors of gastrointestinal nematodes parasite infection in sheep and goats kept in small holder mixed farms in the Kenyan central Highlands. 370 small ruminants were sampled from 66 smallholder mixed farms in Argo-ecological zones 1(humid) and 3 (semi-humid) in the Kenyan central highlands. Fecal eggs counts (FEC) were performed using the modified McMaster technique. Study investigated the burden and risk factors of gastrointestinal nematode parasite infections in sheep and goats kept in smallholder mixed farms in the Kenyan Central Highlands.

Ijaz et al. (2008) carried out a study to find out the infection rate of gastrointestinal tract (GIT) helminth and its association with diarrhea in goats Lahore, Pakistan. For this purpose, 300 fecal samples from goats suffering from diarrhea presented at the outdoor Hospital, Department of clinical medicine and surgery, UVAS Lahore and various private as well as government hospitals located in Lahore were examined coprologically for the presence of helminth. The result revealed that an overall infection rate of GIT helminth was 63.33% in goats. When compared the class wise infection rate, highest infection rate of nematodes (42.67%) was observed, followed by trematodes (16.67%) and cestodes (4%).

Rajapakse et al. (2008) collected and examined the gastrointestinal tracts of 218 crossbred goats representing the dry zone of sir Lanka during a year study period 217(more than 99%) of the animals examined ear infected with one or more species of nematodes. Five species of nematodes were found in the abomasums and intestine. They were *Oesophagostomum* columbiamum (88%), *Haemonchus* contortus (81%), *Trichostrongylus* columbriformis (76%), *Trichostrongylus* axei (59%) and *Trichuris* ovis (59%).

Sueleyman et al. (2009) studied the concentration of haptoglobin, serum amyloid A and ceruloplasma were measured in goats with mixed gastrointestinal infection of nematodes and liver trematodes. Twelve patients who were diagnosed as having mixed helminth infection after detection of *Trichuris* spp, *Trichostrongyloides* spp and *Fasciola* spp and six healthy controls participated in the study. The concentration of the acute phase protein were significantly higher in goat with mixed gastrointestinal infection with nematode and liver trematode. As a result of this study, we determine that the concentration of haptoglobin and serum amyloid A increased in goats with mixed helminth infection.

Pavel vejl and Andriy Lytvynets (2009) investigated the epidemiology of gastrointestinal nematodes of sheep with winter condition. Tracers tests conducted over a 3 years period were aimed at measuring the level and species nematode composition of survival of infective larvae in chilly condition is not significantly affected by *Trichostrongylus axei, Tcolubriformis*, and *Chabertia ovina*. On the contrary the number of *Teladorsagia circumcincta* and *Nematodirus filicollis* significantly increased in middle winter condition. The result confirmed and epidemiology strategy of over wintering in the arrested stage for *Teladorsagia circumcinta* and *nematoduris filicollis*. The epidemiology strategy of genus

Trichostrongylus used both strategy in particular the tolerance of free living stage to cold condition.

2.3. Literature review in context to Nepal

The preliminary work on parasitic diseases of farm livestock in Nepal initiated during 1997-72 under a Swiss associated project. Surveys on common parasitic diseases were undertaken in the Kathmandu Valley and in few other districts representing hills, Terai and high mountains (Singh et al. 1973). This study determined the prevalence of parasitic diseases (Liver fluke) and carried out the identification of nematode parasites, snail species and some ectoparasites. Following this study, prevalence of parasitic diseases were carried out by other workers in different parts of the country but most of these studies were limited to the examination of dung samples for Liver fluke in buffaloes and cattle (commonly) and very rarely studied the gastro-intestinal parasites of sheep and goats.

Thakur and Thakuri (1992) reported that the prevalence of the parasitic infection was 100% in goats during the month of July in western Nepal.

Jha et al. (1993) analyzed the autopsy record of 266 goats carried out at Pakhribas Agricultutre Center, Dhankuta and attributed 6.4 % mortality in goats due to GI nematodes and 3.7% and 1.2 percent mortality due to fascioliasis and phramphistomiasis respectively.

Joshi (1994) recorded 28 percent mortality in goats due to gastro-intestinal nematodes in a sedentary flock at low hill village of western Nepal in which *Haemonchus contortus* was the main worm species involved.

Thakuri (1994) found that the major clinical problem in goat was parasitic diseases which accounted for about 74% of the total treated cases of the 20,499 helminth parasites recorded in the hill district were 34% trematodes, 65% nematodes and 1 percent cestodes.

Joshi (1995) carried out a detailed study on sheep and goats in western hills of Nepal. In this study during 12 months period, a total of 4090 faecal samples were analyzed from both migratory and sedentary systems. Prevalence of worm infection ranged between 60-100 percent in ewes, 7-97 percent in adult goats and 6-100 percent in goat kids.

Dhakal et al. (1996) reported the prevalence of GI nematodes in sheep and goats in Pathivara VDC of Sankhuwasawa district to be 100 percent and 85 percent respectively.

Acharya (1999) carried out a study on GI parasites of goat and sheep of IAAS Livestock farm and recorded *Haemonchus, Ostertagia, Chabertia, Strongyloides, Trichostrongylus, Oesophogostmum and Cooperia.*

Joshi (2000) conducted a study for a period of one year on the epidemiology and clinical significance of gastro-intestinal nematodes on the health and production of goats raised under the sedentary and migratory managements in the hill and mountains in Nepal. The finding showed that the worm burden in the migratory goats was considerably higher than that in the sedentary (management) goats throughout the year. *Ostertagia* was the predominant nematode genus present in the migratory system followed by *Trichostrongylus* species with a low proportion of *Haemonchus.* In sedentary system, however, the predominant genus was *Trichostrongylus* followed by *Haemonchus*.

Nirmal (2000) conducted a study of major diseases of goats in far western region Nepal. In the study, 71 percent cases found as parasitic diseases, among which 54.6 percent due to *Strongyloides* and 61 percent due to coccidians.

Kushwaha (2000) conducted an investigation of goat disease under commercial rearing system from May 1999 to April 2000 in Surkhet. In this study, the prevalence percent age of parasitic disease was 44 percent of which 88 percent due to *Strongyloid* species, 2 percent due to *Ostertagia* species, 7 percent due to *Haemonchus* species and 1 percent due to coccidian species.

Devekota (2006) conducted a study on outbreak of parasitic gastroenteritis in goats under sedentary management in a low hill village of western Nepal. In this study, *Haemonchus contortus* was the most prevalent species.

Jaiswal (2006) carried a study on Fasicioliasis in ruminants at Dhanusa district based on the examination of faecal sample brought to DLOS Janakpur from June 15th to November 15th 2005. Total of 2655faecal samples were examined out of which 70.70%were positive for overall parasitic infestation. Among these, prevalence of fascioliasis was found to be 43.43

percent followed by paramphistomiasis 38.09 percent and round worms 13.43 percent. The prevalence of *Fasciola* infection was found in goat in 31.25 percent in cattle 49.36 percent and in buffalo is 56.02 percent.

Dhital (2006) conducted a study to determine the prevalence of gastro-intestinal parasites in goats at the IASS Livestock farm and Manglapur VDC-2, Chitwan. A total number of seven gastro-intestinal were found from goats. Among them, *Strongyles* types *(Haemonchus, Trichostrongylus, Bunostomum, Cooperia and Ostertagia*) and *Nematodirus* were the commonest parasites, where as *Trchuris, Monizea* and *Oesophagostomum spp* were less common. The faecal samples examination showed that out of 20 samples collected from goats of IAAS from, 90 percent were positive for eggs of one or more types of GI parasites, whereas out of 30 samples collected from Manglapur VDC-2,76.66 percent were positive for eggs of these parasites.

Parajuli (2007) studied intestinal parasites of goats (*Carpa* hircus) and found 181(81.53%) positive samples among 222 total samples from Khasibazar of Kalanki, Kathmandu.

Bashir (2009) studied seasonal prevalence of intestinal helminth parasite of goat (*Capra sp*) and found 46 (46%) positive sample in winter out of 100 samples and 112, (90.3%) samples were found positive in summer out of 124 samples.

Rizal (2010) Studied seasonal prevalence of intestinal helminth parasite of goat (*Carpa* sp.) 170 hosts was found to be infected out of 250 hosts. Over all outcome of the study was 68% prevalence.

Pathak (2011) studied intestinal helminth parasites of goat (*Capra* sp.) found 161(79.70%) positive samples among 202 total samples from Khasibazar of Bagbazar in Kathmandu.

CHAPTER -III

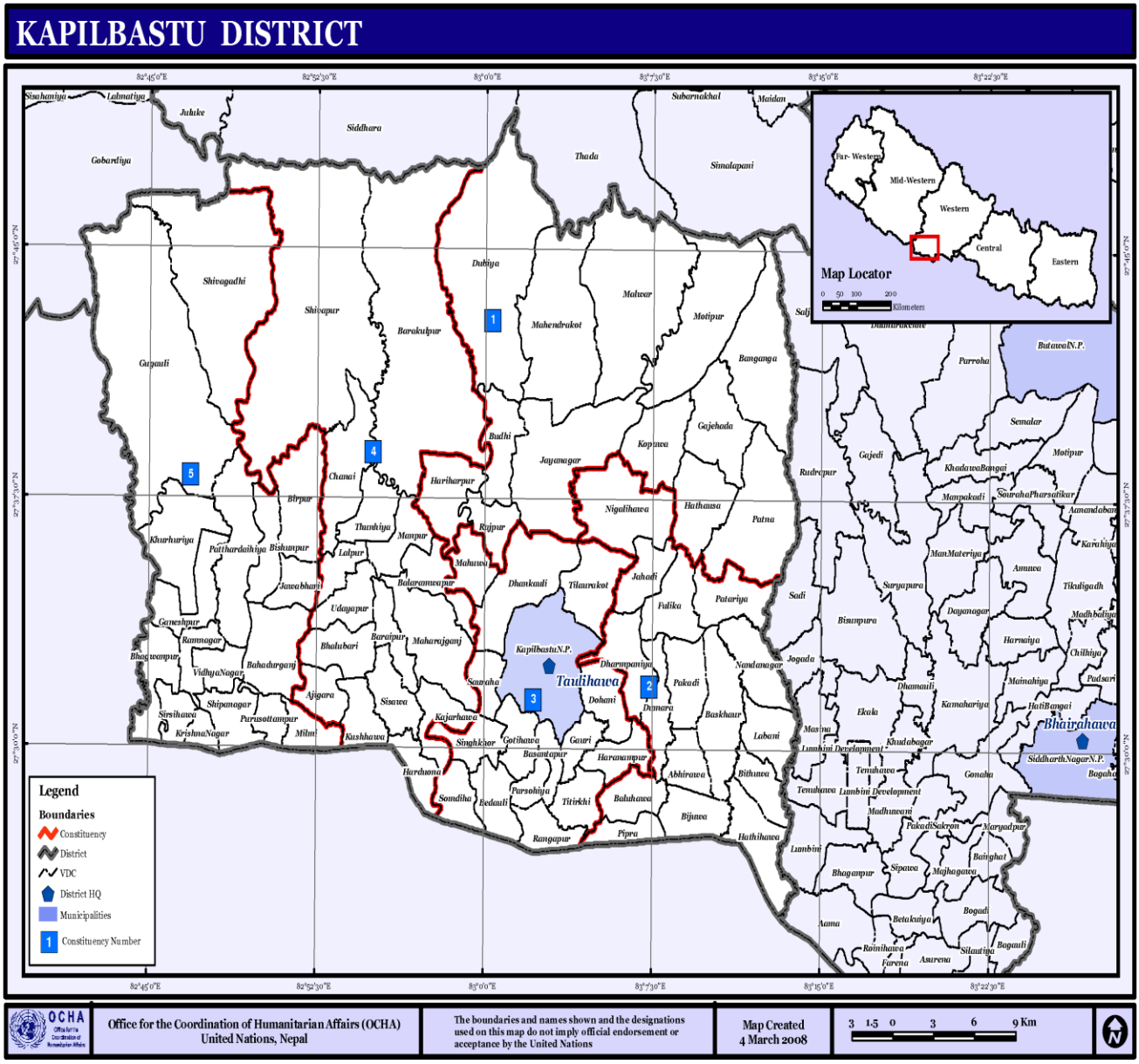
MATERIALS AND METHODS

3.1. Study area

The study area, Kapilvastu is one of the 75 districts of Nepal. The district is situated between 27˚30”N to 27˚ 53’33”N and 82˚45’ 0”E to 83˚ 05’ 00”E. The district covers a total of 1738 km2 area. It is bounded by south in the India, Rupandehi in the east Arghankhachi in the north and Dang in the west.

The study area “Shivraj Municpality-13” Balanagar is the one of the village of Kapilvastu district. It is situated at the plain region of Nepal. It’s about 330 km west for the capital city Kathmandu, where people kept many domestics animals for farming. Buffalo, cows, ox and goats are such domestic animals. The main purpose of the goat by the people is meat which is their main sources of money earning. Goats are supplied from this place to slaughter house of Khasibazar Chandrauta Kapilvastu.

This study is to determine the seasonal prevalence of helminth infection in goats. The stool samples were collected from the study area and brought at Central Veterinary Hospital, Tripureshwor for Laboratory diagnosis.



Map of Kapilvastu district

(Source-www.googal.com/Kapilvastu)

3.2.Study design

Laboratory based diagnosis

3.3. Study period

May-June 2012 to December-January 2012/2013

3.4. Sample size

The total no of samples taken under summer and winter seasons were 106 and 106 respectively. Altogether 212 samples were taken for examination. The samples were collected from Shivraj Municpality-13 Kapilvastu, Lumbani.

3.5. Precautions and preservation

To ensure the better condition during the sample collection the following mentioned precautions were taken.

(i) Only fresh samples were collected.

(ii) The samples were collected in plastic bag.

(iii) 3-4 drops of 2.5%potassium dichromate solution were used to fix the sample.

3.6. Laboratory apparatus and materials

(i) Test tube

(ii)Motor and Pistle

(iii) Slides

(iv)Microscope

(v) Gloves, apron

(vi)Centrifuge tube

(vi)Cover slip

(viii) Centrifuge machine

(ix) Glass rod

(x) Cotton

(xi) Refrigerator

xii) Tea strainer

xiii) Rack

xiv) Dropper

xv) Pasteur pipette

3.7. Chemicals

(i) 2.5% Potasium dichromate solution

(ii) Distilled water

(iii) Zinc Sulphate solution (33%)

(iv)Methylene blue

3.8. Stool examination

The stool samples were collected and brought to laboratory in preservatives and refrigerated. The samples were examined by differential floatation technique, sedimentation technique and Stoll's counting method.

3.8. a. Floatation technique

The floatation technique is widely used for the detection of nematode and cestode eggs. Eggs of cestodes and nematodes are relatively small and light. This techniques, ensures the eggs to float in the floatation liquid.

Three gram of stool sample was taken in a beaker and 42ml of 33% zinc sulphate solution was added. With the help of motor and pistle, the sample was grained lightly and filtered with tea strainer. The filtered solution was poured into a plastic tube of 15 ml and centrifuged at 1000 rpm for 6minutes. More zinc sulphate solution was added so that convex surface is formed at the top of the tube. A cover slip was placed over the top of the tube so that zinc sulphate touches the cover slip for a few minutes and then cover slip was placed on a slide and examined at 10X.

3.8. b. Sedimentation technique

The technique is used for the detection of trematode eggs. It provides good result as the eggs of trematode are bit heavier than the other eggs and deposited at the bottom of the test tube after the centrifugation with zinc sulphate solution.

A drop of deposited materials was taken out from the test tube with the help of pipette and placed on the slide, added a drop of Methylene blue into it and examined under the microscope at 4x and 10x.

3.8. c. Stoll's counting method

It is the easiest quantitative method to count the number of eggs presents in the microscopeic field without the help of Mcmaster (According to Dr. Tom Nola, University of Pennsyivania, 2004)

To 42ml of water, 3 gm of feces was added in a beaker. 3gm of faces was pushed through a sieve into water using a tongue depressor. The remaining water was pushed out from the feces than and water faces mixture was stirred, out of the mixed suspension 0.15 ml was taken on two slides and was spread over. Both Slides were examined for eggs. The total amount of eggs counted multiplies with 100 represents the number of eggs per gram of faeces.

3.9. Key for trematodes, cestodes and nematodes

i) Chaudhri, S.S, Gupta, S.K; Banerjee, D.P; Bhatnagar, P.K; and Ruprah, N.S (2003). General Helminthology. Mannual of Veterinary Helminthology 1:10-184. International Book distributing Company. Lucknow, India.

ii) Pariji, S.C; (1990). Helminthic infections: Trematode, Cestode and nematode. Review of parasite zoonoses 1:41-393. International Book distributing Company. Lucknow, India.

iii) Soulsby, E.J.L (1982). Eggs of worm parasites, Helminth, Arthropods and Protozoa of Domesticated Animals: 7th edition. 1:24-345.The English Language Book Society and Bailliere Tindall. London.

(iv) Gibbons, L.M; Jacobs, D.E; fox, M.T. and Hansen, J. (2007). Faecal Examination for Helminth parasites. The RVC/FAO Guide to Veterinary Diagnostic Parasitology, Electronic Media at the Royal Veterinary College London.

CHAPTER -IV

RESULT

The result has been divided into the following four major parts:

4.1. General prevalence of helminth parasites

4.2. Class-wise seasonal prevalence.

4.3. Seasonal prevalence of cestodes, trematodes and nematodes Shivraj Municpality-13 Kapilvastu.

4.4. Identification of eggs of helminth

4.1. General prevalence of helminth parasites

Out of a total of 212 fecal samples tested with flotation and sedimentation technique, 144 (67.92%) samples revealed the presence of helminth eggs (Fig 1).

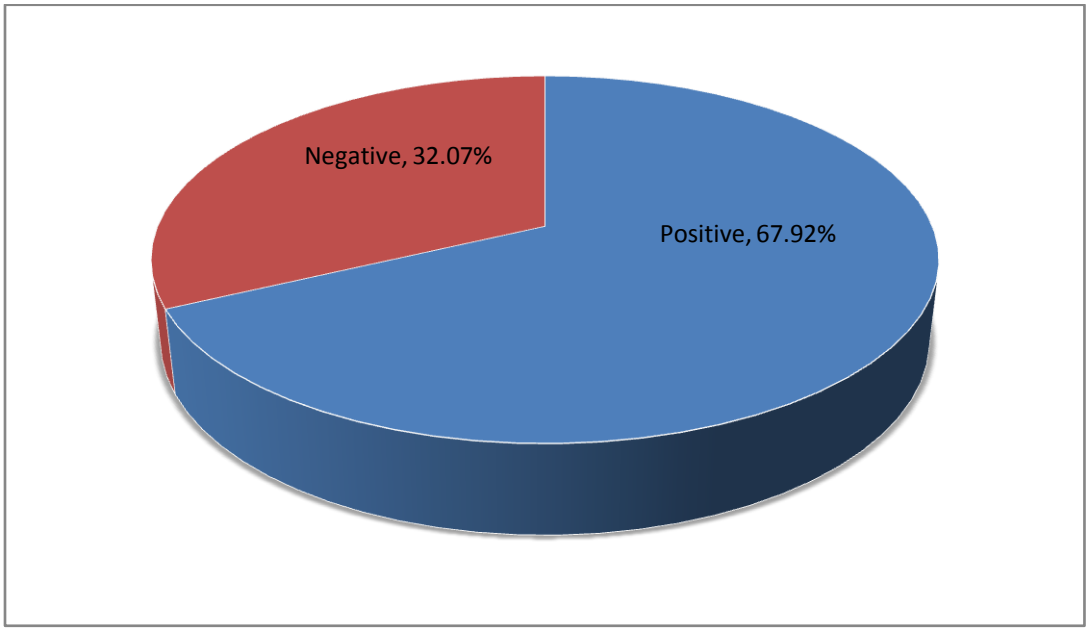


Fig:-1.General prevalence of helminth parasites

The difference of the negative samples during winter and summer were not found statistically insignificant ($\chi 2$= 3.118, p 0.077).

4.2. Class–wise prevalence

This study showed the presence of trematode, cestode and nematode eggs in 32 (22.22%), 18 (12.50%) and 94 (65.27%) fecal samples respectively. The total numbers of genera observed during examination were 18 in number including 3 genera of trematodes, 2 genera of cestodes and 13 genera of nematodes (Table 1). The overall prevalence percentage of each species is given in the following table.

Table1. Observed genera of different classes with prevalence of helminth parasites.

S.N	Class	Genera of Helminth	Percentage
1	Trematoda	*Fasciola*	15.97%
2		*Dicrocoelium*	3.47%
3		*Paramphistomum*	2.77%
4	Cestoda	*Taenia sp*	9.72%
5		*Moniezia*	2.77%
6	Nematoda	*Toxocara*	16.66%
7		*Strongyl*	1.38%
8		*Bunostomum*	2.77%
9		*Chabertia*	4.16%
10		*Capillaria*	4.86%
11		*Oesophagostomum*	8.33%
12		*Heamonchus*	3.47%
13		*Cooperia*	2.08%
14		*Nematodirus*	0.69%
15		*Strongyloides*	6.25%
16		*Trichuris*	5.55%
17		*Trichostrongyloid*	4.86%
18		*Ostertagia*	1.38%
19		Others	4.86%

The highest prevalence was shown by *Toxocara* sp. (16.66%) *and lowest prevalence was shown Nematodirus* sp. (0.69%)

4.3. Seasonal prevalence of helminth parasites in goats

Out of 106 samples in each winter and summer 58 (54.71%) samples were positive in winter and 86 (81.13%) in summer. The rate of prevalence of helminth was found more during summer 81.13% then in winter 54.71% (Fig. 2). The seasonal prevalence of different genera during winter and summer were not found statistically insignificant ($\chi 2$= 3.118, p=0.077).

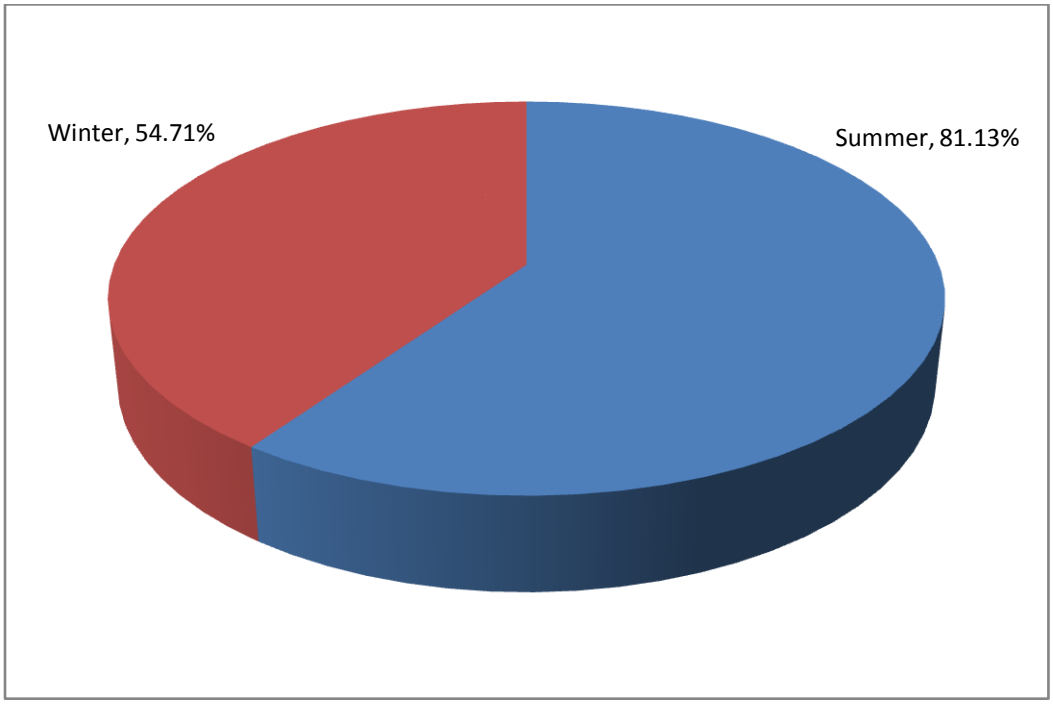


Fig.2:- Seasonal prevalence of helminth

4.3. a. Seasonal prevalence of trematode of goats

Out of 106 goat fecal samples teted, 19 (17.92%) were positive in summer and 13 (12.26%) were positive in winter season. Altogether 32 (22.22%) samples were found positive for trematodes. Out of 13 positive trematode samples of winter 11 (10.37%) samples were positive for *Fasciola* sp. and 2 (1.88%) were positive for *Dicrocoelium* sp (Fig. 3). Similarly out of 19 positive samples of summer 12 (11.32%) samples were positive for *Fasciola* sp. and 4 (3.77%) were positive for *Paramphistomum* sp. and *3 (2.83%)* were positive for *Dicrocoelium* sp. Prevalence of *Fasciola* sp. (15.97%) was found to be the highest followed

by *Dicrocoelium* sp. (3.47%) and *Paramphistomum* sp. (2.72%). The difference in the prevalence of different genera of trematodes during winter and summer were not found statistically insignificant ($\chi 2$= 1.325, p 0.25).

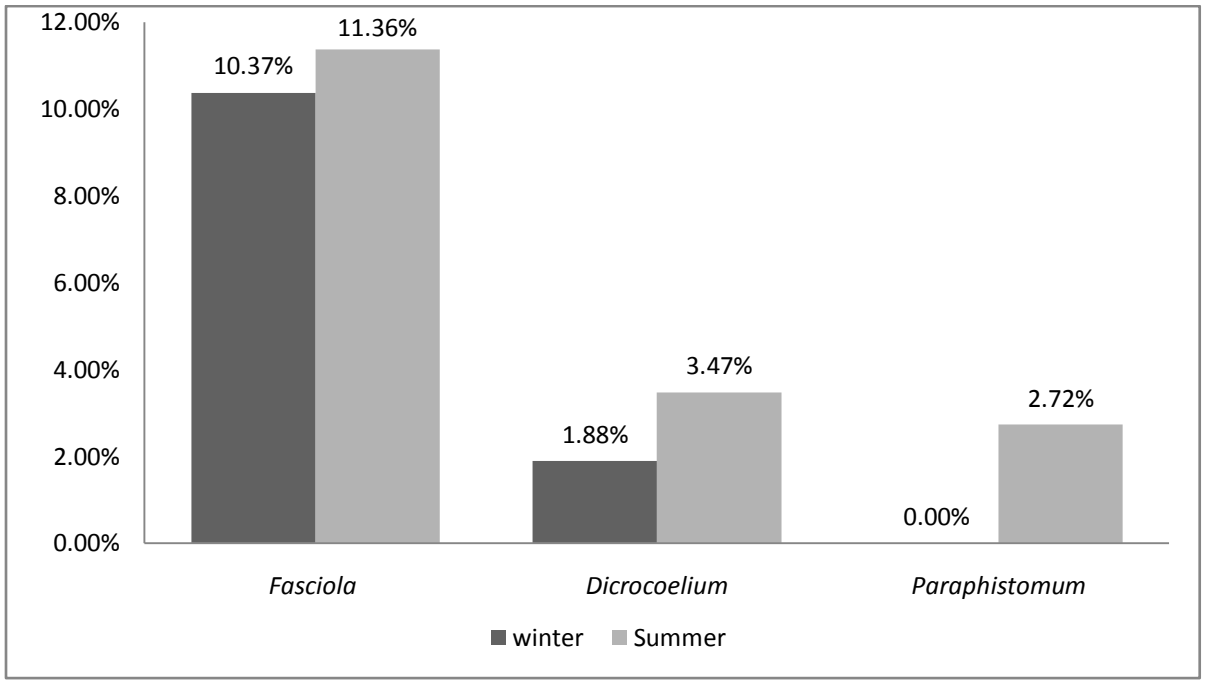


Fig:-3.Seasonal prevalence of trematodes in goat

4.3. b. Seasonal prevalence of cestode eggs in goats

Out of 106 samples in each summer and winter, Altogether 18 (12.50%) samples were found positive for cestodes. Among 8 (7.54%) samples were positive in summer and 6(5.66%) samples were positive in winter season for *Taenia,* sp. Similarly in *Moniezia* sp. 4 (3.77%) summer and winter (0.00%) (Fig. 4). The difference in the prevalence of different genera of cestodes during winter and summer were not found statistically insignificant ($\chi 2$= 2.186, p= 0.139).

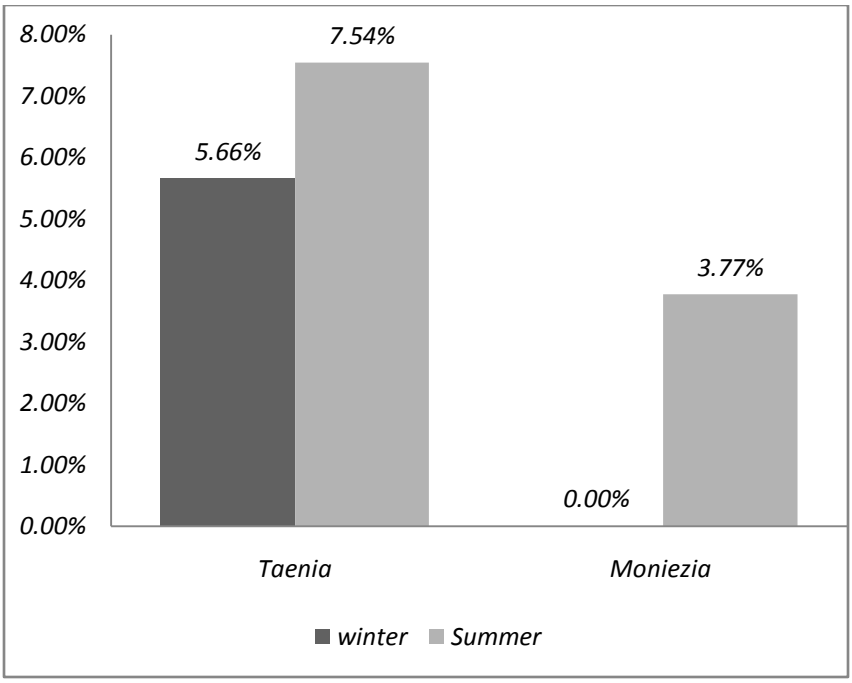


Fig:-4. Seasonal prevalence of cestodes of goat

4.3. c. Seasonal prevalence of nematode in goats

Out of 106 samples in each summer and winter, 56 (52.83%) were positive in summer and 38 (35.84%) were positive in winter season. Altogether 94 (65.27%) samples were found positive for nematodes. The difference in the prevalence of different genera of nematodes during winter and summer were found statistically insignificant ($\chi 2$= 6.193, P<0.013, d. f. =1).

Table 2 Prevalence of nematodes during winter

S.N	Nematode	During summer	Prevalence
1	*Toxocara*	12	11.32%
2	*Chabertia*	2	1.88%
3	*Capillaria*	3	2.83%
4	*Oesophagostomum*	6	5.66%
5	*Heamonchus*	3	2.83%
6	*Cooperia*	1	0.94%

7	*Strongyloides*	4	3.77%
8	*Trichuris*	3	2.83%
9	*Tricostrongyloid*	1	0.94%
10	*Others*	3	2.83%

Table 3 Prevalence of nematodes during summer

S.N	Nematode	During summer	Prevalence
1	*Toxocara*	12	11.32%
2	*Strongyl*	2	1.88%
3	*Bunostomum*	4	3.77%
4	*Chabertia*	4	3.77%
5	*Capillaria*	4	3.77%
6	*Oesophagostomum*	6	5.66%
7	*Heamonchus*	2	1.88%
8	*Cooperia*	2	1.88%
9	*Nematodirus*	1	0.94%
10	*Strongyloides*	5	4.71%
11	*Trichuris*	4	3.77%
12	*Trichostrongyloid*	4	3.77%
13	*Ostertagia*	2	1.88%
14	Others	4	3.77%

4.4. Identification of eggs of helminth parasites

Out of 212 total samples examined with the help of sedimentation and floatation technique, 144 (67.92%) revealed the presence of eggs of helminths.

Altogether 18 genera were observed; belonging to 3 trematodes, 14 nematode and two cestodes (Table1).

The genera of various eggs of helminth parasites have been identified according to their characters and morphology. Identification of eggs of helminth in brief was done as fallows.

Trematodes

Dicrocoelium sp. (Rudolphi, 1819)

Classification

Class - Trematoda

Subclass - Digenea

Family - Dicrocoelidae

Genus - *Dicrocoelium*

Description of the eggs

Eggs are 36-45 by 23-30 µm in size, dark brown in colour, operculated, usually with a flattend side, contains miracidium when passed in the faeces.

In 1899, Looss reported *Dicrocoelium lanceatium* infection from bile duct of the sheep, goat and cattle.

In Nepal 2007, Mukhiya reported *Dicrocoelium lanceatium* infection in buffaloes of Satungal (Kathmandu).

Fasciola sp. (Linnaeus, 1758)

Classification

Class - Trematoda

Subclass - Digenea

Family - Fasciolidae

Genus - *Fasciola*

Description of the egg

Eggs are 130-197 by 63-104 µm in size, oval shaped, yellowish in colour, consists of embryonic mass and shell, operculum usually indistinct.

In 1758, Linnaeus reported *Fasciola* hepatica from the bile ducts of sheep and other ruminants.

In Nepal 1967-92, Parajuli reported *Fasciola* sp. in buffaloes from Surkhet district.

Paramphistomum sp. (Zender, 1790)

Classification

Class - Trematoda

Subclass - Digenea

Family - Paramphistmatidae

Genus - *Paramphistomum*

Description of the egg

Eggs are 114-176µm by 73-100µm in size, oval in shape, whitish to transparent in colour with distinct operculum knob-like thickening at the acetabular end of shell, embryonic cells distinct.

In 1790, Zender reported *Paramphistomum cervi* from the caecum of Indian Patient.

In Nepal 1993, Jha et al. reported *Paramphistomum* sp. in goat.

Cestodes

Moniezia sp. (Rudolphi, 1810)

Classification

Class - Eucestoda

Subclass - Anoplocephalidea

Family - Anoplocephalidae

Genus - *Moniezia*

Description of the eggs

Eggs are 56-75 µm in size; tringular, globular or quadrangular in shape and contain a well developed pyriform apperatus.

In 1810, Rudolphi reported *Moniezia* expansa from the small intestine of sheep, cattle and other ruminants.

In Nepal 1989, Gupta first reported *Moniezia* expansa from goat.

Taenia sp. (Linnaeus, 1758)

Classification

Class - Eucestoda

Subclass - Dilepididea

Family - Taenidae

Genus - *Taenia*

Description of the eggs

Eggs are 24-41µm in diameter, spherical in shape, brown to dark –yellow in colour, thick shelled and contain an onchosphere.

In 1758, Linnaeus reported *Taenia* solium in the small intestine of man.

In Nepal 1998, Paudyal reported *Taenia* in pigs of Kathmandu and Dharan.

In Nepal 2009, Bashir reported *Taenia* sp. in goat from Kathmandu**.**

Nematodes

Haemonchus sp. (Rudolphi, 1803)

Classification

Class - Nematoda

Order - Strongylid

Family - Trichostrongylidea

Genus - *Haemonchus*

Description of the eggs

Eggs are 70-85 by 41-48 µm in size, oval in shape and embryo 16-32 called when laid.

In 1803, Rudolphi reported *Haemonchus* species from the abomassum of sheep, cattle and other ruminants.

In Nepal 1997, Joshi reported *Haemonchus* contortus in sheep and goat from western hills of Nepal.

Strongyloides sp. (Wedl, 1856)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Rhabditida

Family - Strongylidae

Genus - *Strongyloides*

Description of the eggs

Eggs are 40-64 by 20-40 µm in size, ellipsoidal, thin shell, embryonated when laid.

In 1911, Ranson reported *Strongyloides* sp. from the small intestine of sheep, goat and cattle.

In Nepal 1996, Dhakal, Jha and Basnet reported *Strongyloides* in goats of Pathivara VDC Sankhuwasava.

In Nepal 2009 Bashir reported *Strongyloides* sp. from Kathmandu.

Trichostrongylus sp. (Zender, 1800)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Trichostrongylidae

Genus - *Trichostrongylus*

Description of the eggs

Eggs are 79-118 by 39-52 µm in size, oval in shape and bilaterally symmetrical, shell has a thin and transparent outer chitinous layer and a thin inner lipodial layer, embryonic mass multi segmented and varies from 16-32 in numbers.

In 1892, Giles reported, *Trichostrongylus* from small intestine of goat, sheep and cattle.

In Nepal 1996, Dhakal, Jha and Basnet reported Tricho*strongylus* in goats of Pathivara VDC Sankhuwasava.

Chabertia sp. (Gmelin, 1790)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Trichonematidae

Genus - *Chabertia*

Description of the eggs

Eggs are 90-105 by 52-55 µm in size, oval shaped laid in morula stage.

In 1790, Gmelin reported *Chabertia ovine* from the colon of the sheep cattle and other ruminants.

In Nepal 1997, Joshi reported *Chabertia* sp. in sheep and goat from western hills of Nepal.

Oesophagostomum sp. (Giles, 1892)

Classification

Class - Nematoda

Subclass - Secernentea

Family - Trichonematidae

Genus - *Oesophagostomum*

Description of the eggs

Eggs are 70-89 by 34-42 µm in size, oval in shape, thin shelled embryonated when laid.

In 1803, Rudoiphi reported *Oesophagostomum* radiatum from the colon of cattle and water buffalo.

In Nepal 1982 ADPCD reported *Oesophagostomum* sp. in pig, cattle and buffaloes from Kathmandu. In 1999, Acharya reported *Oesophagostomum* sp. in sheep and goat of IAAs livestock farm, Chitwan.

Trichuris sp. (Roederer, 1761)

Classification

Class - Nematoda

Subclass - Adenophorea

Order - Enoplioda

Family - Trichuridae

Genus - *Trichuris*

Description of the eggs

Eggs are 70-80 by 30-42 µm in size, brown in colour, contain unsegmented embryo, barrel shaped with transparent plug at either pole.

In 1795, Abildgaard reported *Trichuris* ovais from caecum of sheep, cattle and other ruminants.

In Nepal 1982, ADPCD reported *Trichuris* trichiura in goat, sheep and buffalo from Kathmandu. In 1988, Gupta reported Trichuris trichiura in human from Kirtipur.

Capillaria sp. (Zender, 1800)

Classification

Class - Nematoda

Subclass - Adenophorea

Order - Enoplioda

Family - Trichuridae

Genus - *Capillaria*

Description of the eggs

Eggs are 30-63 µm in size, barrel shaped, contain unsegmented embryo colourless shell.

In 1800, Zender reported *Capillaria* sp. from the small intestine of dog and cattle.

In Nepal 1982, ADPCD reported *Capillaria* sp. from Kathmandu.

Dictyocaulus sp. (Rudolphi, 1809)

Classification

Class - Nematoda

Subclass - Adenophorea

Order - Strongylida

Family - Dictyocaulidae

Genus - *Dictyocaulus*

Description of the eggs

Eggs are 82-88 by 30-33 µm in size, ellipsoidal, contain fully developed larva when laid or first stage larva may pass.

In 1809, Rudolphi reported *Dictyocaulus* sp. from the bronchi of sheep, goat and wild ruminants from Nepal.

In Nepal 1982, ADPCD reported *Dictyocaulus* sp. in goat and sheep from Kathmandu.

Toxocara sp. (Linstow, 1902)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Ascaridida

Family - Ascarididae

Genus - *Toxocara*

Description of the eggs

Eggs are 75-95 µm in size, slightly oval with smooth shell often single celled, occasionally two celled.

In 1902, Linstow reported *Toxocara* leonine from small intestine of dog, cat and wild felines.

In Nepal 1987, Ghimire reported *Toxocara* sp. in cattle buffaloes and goat from Surkhet district.

Cooperia sp. (Railliet, 1803)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Trichostrongylidae

Genus - *Cooperia*

Description of the eggs

Eggs are 68-82 by 34-42 µm in size, ellipitical, consist of segmented ovum and a double layered covering. In 1803, Railliet reported *Cooperia* sp. from the small intestine and abomasums of ruminants.

In Nepal 2009 Bashir reported *Cooperia* sp. from Kathmandu.

In 2006, Dhital reported *Cooperia* sp. in goats of IAAS livestock farm and Manglapur VDC - 2 Chitwan.

Ostertagia sp. (Stadelmann, 1894)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Trichostrongylidea

Genus - *Ostertagia*

Description of the eggs

Eggs are 80-100 by 40-45 µm in size, elliptical in shape, contain fully developed larva within when laid.

In 1907, Ranson reported *Ostertagia* sp. from the abomasums and small intestine of sheep, cattle and other ruminants.

In Nepal 1982, ADPCD reported *Ostertagia* in pig, cattle and buffaloes from Kathmandu. In 2006, Dhital reported *Ostertagia* sp. *in* goats of IAAS livestock farm and Manglapur VDC - 2, Chitwan.

Bunostomum sp. (Railliet, 1900)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Ancylostomatidae

Genus - *Bunostomum*

Description of the eggs

Eggs are 79-106 by 47-50µm in size, elliptical, have blunt ends and darkly pigmented embryonic cells.

In 1808, Rudolphi reported *Bunstomum* trigonocephalum in the small intestine of sheep and goats.

In Nepal 1996, Dhakal, Jha and Basnet reported *Bunstomum* sp. from goats of Pathivara VDC, Sankhuwasava.

Nematodirus sp. (Goeze, 1802)

Classification

Class - Nematoda

Subclass - Secernentea

Order - Strongylida

Family - Trichostrongylidea

Genus - *Nematodirus*

Description of the eggs:-

Eggs are 152-230 by 67-121 µm in size, elliptical contain an embryo of about eight cells when passed by the host.

In1802, Rudolphi reported *Nematodirus* sp. fiicolis in the small intestine of sheep, cattle and other ruminants.

In 2006, Dhital reported *Nematodirus* sp. in goats at IAAS livestock farm and Mangalpur VDC-2 Chitwan.

In Nepal 2007, Parajuli first reported *Nematodirus* sp. from Kathmandu.

Strongylus sp

Family - Strongylidae

Genus - *Strongyl*

Description of the eggs:-

Eggs are 80 µm long, thin shelled, barrel shaped, blastomere present

In Nepal 2011, Rizal reported *Strongylus* sp. from Arghakhachi.

4.5 Intensity of infections

Table.4. Intensity of infection in summer

S.N	Class	Name of the Genera	+	+ +	+ + +	+ + ++
1	Trematoda	*Fasciola*	5	3	3	1
2		*Dicrocoelium*	3	-	-	-
3		*Paraphistomum*	2	2	-	-
4	Cestoda	*Taenia*	3	3	1	1
5		*Moniezia*	1	2	1	-
6	Nematoda	*Toxocara*	5	4	2	1
7		*Strongyl*	1	1	-	-
8		*Bunostomum*	2	1	1	-
9		*Chabertia*	2	1	1	-
10		*Capillaria*	3	1	-	-
11		*Oesophagostomum*	3	2	1	-
12		*Heamonchus*	2	-	-	-
13		*Cooperia*	1	1	-	-

14		*Nemtodirus*	1	-	-	-
15		*Strongyloides*	2	2	1	-
16		*Trichuris*	3	1	-	-
17		*Tricostrongyloid*	2	1	1	-
18		*Ostertagia*	1	-	1	-

Note: The figure in the column is the no. of samples

(i) + =Light infection (less than 2 ova per field)

(ii) ++ =Mild infection (2-4 ova)

(iii) +++ =Moderate infection (4-6 ova)

(iv)++++ =Heavy infection (6or more ova)

In summer, 80 (75.47%) samples were showed mixed infection. Light infection shown by *Fasciola* i.e. 5 (+) positive samples .Mild infection shown by *Toxocara* 5 (++) positive samples. Moderate infection was shown by *Toxocara* 4 (+++) positive samples and heavy infection was shown by *Taenia* 1, *Fasciola 1* (++++) and *Toxocara* 1 (++++) positive samples.

Table.5. Intensity of Infection in winter

S.N	Class	Name of the genera	+	++	+++	++++
1	Trematoda	*Fasciola*	5	3	2	1
2		*Dicrocoelium*	2	-	-	-
	Cestoda	*Taenia*	3	1	2	-
	Nematoda	*Toxocara*	4	4	3	1
3		*Chabertia*	1	-	1	-
4		*Capillaria*	1	2	-	-
5		*Oesophagostomum*	3	2	1	-
6		*Heamonchus*	1	1	-	1
7		*Cooperia*	1	-	-	-

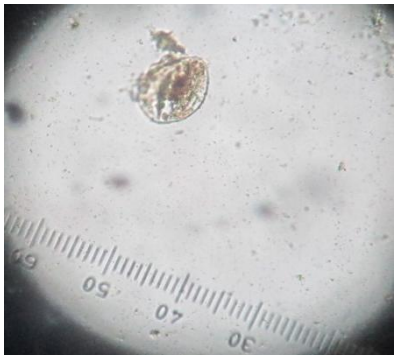
8		*Strongyloides*	3	-	1	-
9		*Trichuris*	1	2	-	-
10		*Tricostrongyloid*	-	1	-	-

Seasonally in winter 54 (50.94%) samples were observed mixed infection. Light infection shown by *Fasciola* 5(+) positives samples .Mild infection shown by *Toxocara* 4 (++) positive samples. Moderate infection was shown by *Toxocara* i.e. 3 (+++) positives samples and Heavy infection was shown by *Fasciola* with 1(++++) positives samples.

4.6 Multiple of infections

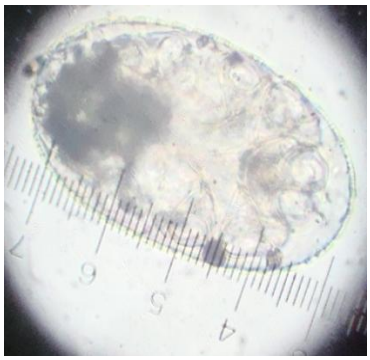
In the current study, the rate of mixed infection was also observed. Among 144 (67.92%) positive samples, 134 (63.20%) samples were found to have mixed infection.

Plate 1:- EGGS OF TREMATODES OBSERVED



a. *Dicrocoelium* (10X x10X)

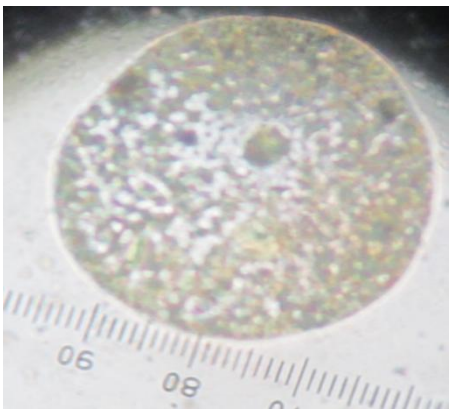
b.*Fasciola* (10X x10X)



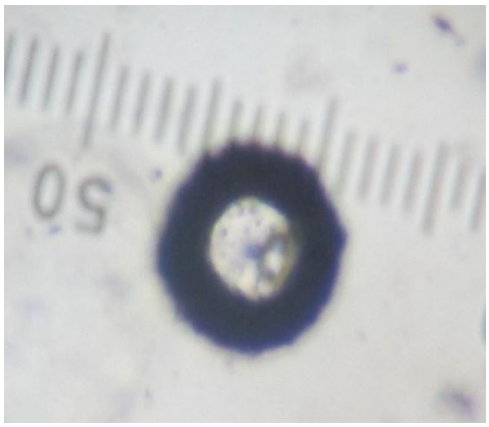
c. *Paramphistomum*

(10X x10X)

EGGS OF CESTODES OBSERVED



d. *Moniezia* (10X x 10X)

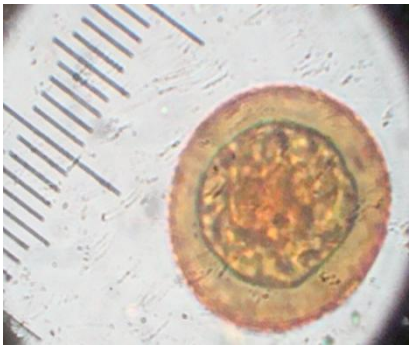


e. *Taenia* (10X x 10X)

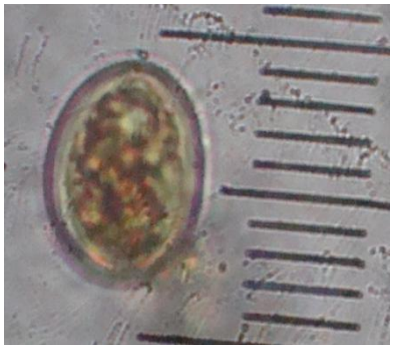
Plate:-2

EGGS OF NEMATODES OBSERVED

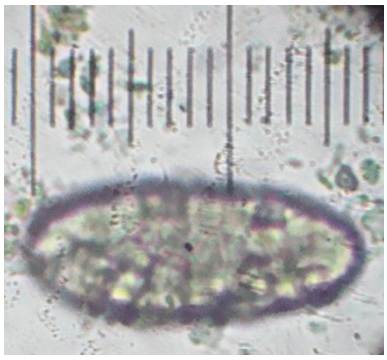
f. Haemonchus(10X x 10X)



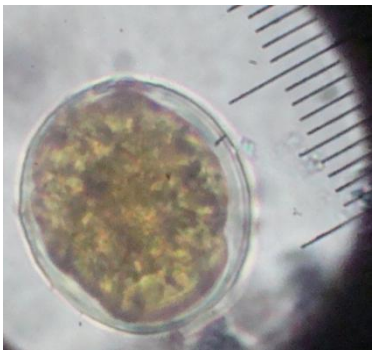
g. *Toxocara* (10X x 10X)



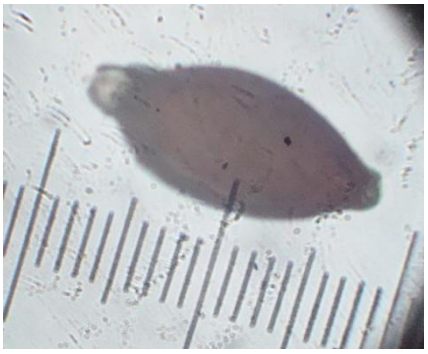
h. *Strongyl*(10X x 10x)



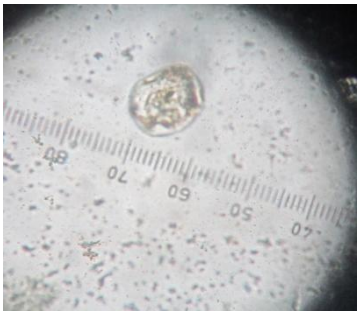
Bunostomum(10Xx10X)



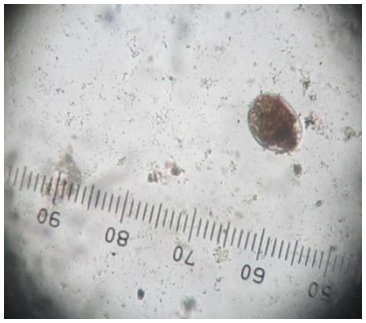
Oesophagostomum(10X x10X)



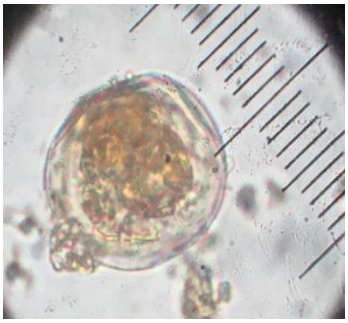
Trichuris (10X x 10X)



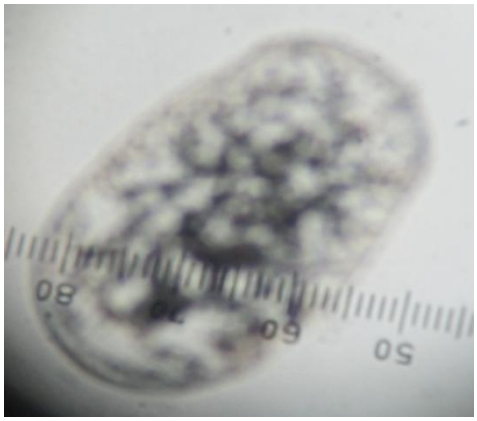
Dictyocaulus(10X x 10X)



Chabertia(10X x 10X)



Capillaria(10X x10X)

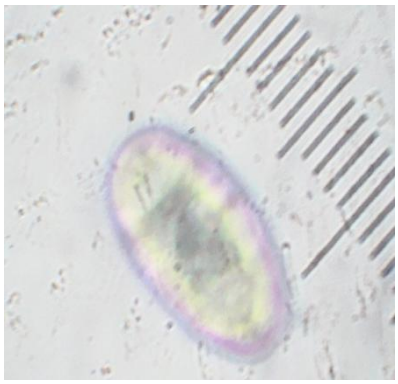


Trichostrongylus(10X x 10X)

Strongyloides(10X x 10X)

Ostertagia(10X x 10X)

Cooperia (10X x 10X)



Nematodirus(10X x10X)

Laboratory

Microscopic observation of fecal sample

Taking Aid of expert

CHAPTER –V

DISCUSSIONS

5.1. Discussions

The aim of study was to investigate the seasonal prevalence of intestinal helminth parasites in goat. Present study detected eggs of helminth parasites in 86 (81.13%) and 58 (54.71%) samples during summer and winter season. It is thought that the prevalence of gastro – intestinal parasites is considerably influenced by the climatic conditions and as far as possible the evidence for the distribution and prevalence of the disease is presented by geographical area' roughly corresponding to climatic conditions. Generally the warm and humid conditions, which prevail in much of Kapilvastu district and especially the study area, provide good conditions for many gastro-intestinal parasites to flourish. Continuous high rainfall throughout the year in parts of the region means that there is no season during which the parasites are not a problem. (Tiyo et al 2008). The present study was carried out in the month of May/June (summer) 2012 and December/January (winter) 2012-2013.

In the present study, 3 genera of trematodes, 2 genera of cestodes and 14 genera of nematodes were found. Among trematodes *Fasciola*, was common during winter and summer but *Dicrocoelium* was found only during winter and *Paramphistomum* was observed during summer only. In cestodes, the observed genera were *Moniezia* was found only summer and *Taenia* found in both seasons. Among nematodes, *Toxocara, Bunostomum, Chabertia, Capillaria, Oesophagostomum, Strongyl Heamonchus, Cooperia, Nematodirus, Strongyloides, Trichuris, Trichostrongylus, Ostertagia* were found. Similarly *Paraphistomum, Bunostomum, Nematodirus, Ostertagia,* were not observed during winter.

The seasonal prevalence of trematode genera found in goat were *Fasciola* 10.37%\11.32% *Paramphistomum* 0.0%\3.77% and *Dicrocoelium* 1.88%\2.83% .Among cestodes *Taenia* 5.66%\7.54% and *Moniezia* 0.0%\3.77% were found. In nematodes *Toxocara* 11.32%\11.32%, *Strongyl,* 0.0%\1.88%, *Bunostomum* 0.0%\3.77%, *Chabertia* 1.88%\3.77%, *Capillaria* 2.83%\3.77%, *Oesophagostomum* 5.66%\5.66%, *Dictyocaulus* 2.83%\3.77%, *Heamonchus* 2.83%\1.88%, *Cooperia* 0.94%\1.88%, *Nematodirus,* 0.0%\0.94%,

*Strongyloide*s 3.77%\4.71%, *Trichuris* 2.83%\3.77%, *Trichostrongylus* 0.94%\3.77%, *Ostertagia* 0.0%\1.88% were found.

The present study exhibited 10.37%, 11.32% prevalence rate of fascioliasis during winter and summer respectively. The increase in the prevalence during summer may be due to increase in humidity and availability of favorable temperature. High prevalence of *Fasciola* in goat was reported from Surkhet (Ghimire, 1987), 58% from Chitwan district (Dhakal and Kharel 1988), 31.25% infection from Dhanusa district (Jaiswal 2006), 31.5% from Kenya (Waruiru Otieno and Mutune 2005) and Himachal Pradesh, India (Jithendran and Bhat 2001). Similarly, the prevalence of Dicrocoelium was reported to be 2.5% Jithendran and Bhat 2001 and in the present study its prevalence was reported to be 1.88%. Ndao and his fallow researcher reported *Paramphistomum* in 1991, Jithendran (1997) and Jithendran et al. 2001.

Moniezia sp. has been reported from Kathmandu and Surkhet district (Ghimire 1987) among buffaloes, sheep, goat and cattle. In the present study, *Moneizia* has been reported only in summer.

A research by Wanjala et al. (2002) showed 52% infection in small ruminants in pastoral community in Narok district Kenya. While this study had shown overall (67.92%) infection, the main genera prevalent in the study were *Fasciola, Moneizia, Dictyocaulus, Oesophagostomum, Chabertia and Strongyloides.* Whereas Yadav et al. (2005) reported the highest incidence of *Heamonchus, Trichostrongylus, Bunostomum, Oesophagostomum* and *Strongyloides.*

The overall prevalence of helminth parasites among goats raised under traditional husbandry system in South East Nigeria (Opera et.al., 2005) were found 90.1 percent of which Nematodes infection were 78.4 percent, trematodes and cestodes infection were 13% and 8.7 % respectively. In these study 32 (22.22%) of trematodes infection, 17 (11.08%) of cestodes and 94 (65.27%) nematodes infection were found. Presence of suitable temperature and moisture sever best for the breeding and development of the helminth parasites. So this could be the reason behind excessive prevalence of certain helminth parasites.

Current study showed a higher prevalence of multiple infection. Among 144 (67.92%) positive samples, 134 (63.20%) samples were found to have mixed infection with 2 to 4 species in each microscope field.

Mankir (2007) of eastern Ethiopia reported highest prevalence rate of *Haemonchus* followed by *Trichostrongylus* in goats and sheep. The warm burden was recorded highest during two rain seasons (Peak in May and September). Thirteen species of nematodes and four species of flukes were reported. Present study showed highest prevalence of *Toxocara, Oesophagostomum, Chabertia,* and *Strongyloides*.

A research work by Ijaz et al (2008) on goats of Lahore, Pakistan showed highest infection rate of nematodes (42.67%)followed by trematodes (16.67%)and cestodes (4%). But present study showed extremely higher overall prevalence rate of nematodes (65.27%), cestodes (11.08%), and trematodes (22.22%). The highest prevalence match *Toxocara, Oesophagostomum.* The difference in the result could be due to the variation in weather conditions and humidity in atmosphere.

According to Islam et al (2008) the most commonly occurring gastrointestinal parasites in goats and sheep were *Emeria, Trichostrongylus, Haemonchus, Moniezia* and *Fasciola.* Similarly present study depicted *Oesophagostomum, Chabertia, Strongyloides,* and *Dictyocaulus* as the most prevalent helminth parasites of goats.

CHAPTER-VI

CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

The present study was carried out in summer 2012 and winter 2012-2013. The site of collection of samples was Shivraj Municpality-13 of Kapilvastu, Lumbini. From the present study, 86 (81.13%) and 58 (54.71%) samples were found positive in summer and winter out of 212 samples. In the present study, 3 genera of trematodes, 2 genera of cestodes and 14 genera of nematodes were found.

Among trematodes *Fasciola*, was common during winter and summer but *Dicrocoelium* was found only during winter and *Paramphistomum* was observed during summer only. In cestodes, the observed genera were *Moniezia* was found only summer and *Taenia* found in both seasons. Among nematodes, *Toxocara, Strongyl, Bunostomum, Chabertia, Capillaria, Oesophagostomum, Heamonchus, Cooperia, Nematodirus, Strongyloides, Trichuris, Trichostrongylus and Ostertagia* were found. Similarly *Paraphistomum, Strongyl, Bunostomum, Nematodirus, Ostertagia,* were not observed during winter. In the current study, the rate of mixed infection was also observed. Among 144 (67.92%) positive samples, 134 (63.20%) samples were found to have mixed infection.

6.2. RECOMMENDATIONS

On the basis of outcome of the present study, following measures are recommended:

(1) Anthelminthics should be applied to eliminate the parasites from the host.

(2)The program for awareness among the livestock farmer public butchers and goat dealers regarding the ill effect of the infection and zoonotic disease by helminth parasites should be created.

(3) The pastures can be made free of helminth parasites by breaking their life cycle by eradicating inter mediate host, snail though biological control method.

(4) For the prevention of spread of gastro-intestinal parasites, the contamination of pastures should be prevented by treating the hosts with anthelminthics.

(5) Impure water should not supply.

(6) Animal slaughter and meat inspection act should be implemented for better quality and disease free meat.

(7)Further research work should be carried out.

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