Comparative Helminthology in Domesticated and Farmed Buffaloes (Bubalus bubalis) of Peshawar, Pakistan.

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Abstract
Buffaloes, a vital livestock species in Pakistan, are seriously threatened by helminth infections in terms of both health and productivity. With this study, the frequency of helminth parasites in domesticated and farmed buffaloes in Peshawar, Pakistan, was contrasted. Using the methods of differential floatation, sedimentation, and direct smear, 200 fecal samples 100 from domesticated and 100 from farmed buffaloes were collected and analyzed. Using their morphological features, helminth eggs and larvae were identified. Compared to farmed buffaloes (2%), domesticated buffaloes had a considerably higher overall frequency of helminth infections (22%). The Trematodes *Fasciola hepatica*, *Fischoederius cobboldi*, *Gastrothylax crumenifer*, *Fasciola gigantica*, and *Carmyerius spatiosus*, as well as the Nematodes *Mecistocirrus digitatus* and *Oesophagostomum radiatum*, were found to be seven species of helminth parasites. *Mecistocirrus digitatus* (3%), *Oesophagostomum radiatum* (1%), *Fasciola gigantica* (1%), *Fasciola hepatica* (5%), *Gastrothylax crumenifer* (4%), and *Fischoederius cobboldi* (7%), the most common among farmed buffaloes. *Fasciola hepatica* (1%) and *Gastrothylax crumenifer* (1%) were the only pathogens found in farmed buffaloes. Analysis: The increased frequency of helminth infections in domesticated buffaloes emphasizes the need for better deworming procedures, management strategies, and public awareness initiatives to reduce their financial effects on livestock productivity.

Keywords: Helminth parasites, buffaloes, domesticated, farmed, prevalence, Peshawar, Pakistan

Introduction

For rural populations and the economies of many developed and emerging nations, including Pakistan, livestock is essential. The cattle industry relies heavily on buffaloes (*Bubalus bubalis*), which provide premium milk, meat, leather, and draft power (1, 2). For a sizeable portion of the rural population in Pakistan, the livestock industry is a vital source of employment and income, contributing considerably to the nation's agricultural GDP (3, 4).

Globally, helminth infections especially those caused by gastrointestinal parasites pose a serious danger to cattle output. Clinical and subclinical disorders resulting in slower development rates, decreased production of milk and meat, decreased fertility, reduced labor ability, and greater susceptibility to other infections are all possible outcomes of these parasite infections (5, 6). The cattle sector suffers significant financial losses as a result of helminth infections, including direct losses from reduced productivity, higher treatment costs, and death as well as indirect losses from restricted trade and poor product quality (7, 8).

To effectively control and prevent helminth infections in cattle, it is imperative to comprehend their epidemiology and prevalence. To maintain sustainable livestock output and food security in Pakistan, where the livestock industry is essential to the country's economy and rural populations' way of life, it is critical to fight helminth infections.
In Peshawar, Pakistan, this study sought to evaluate and examine the frequency of helminth parasites in domesticated and farmed buffaloes as well as to determine the variables influencing the infection patterns that were noted. The results of this study will help design focused treatments and management plans that will lessen the financial toll that helminth diseases have on the area's buffalo herd.

Materials and Methods

Study Area and Sample Collection

The Veterinary Parasitology Laboratory, Department of Animal Health, Agriculture University Peshawar, Khyber Pakhtunkhwa, Pakistan was the site of the study. 200 fecal samples in all, 100 from domesticated and 100 from agricultural buffalo in various Peshawar district locations, were taken. The samples were taken straight from the rectum of buffaloes that appeared healthy and were not taking any anthelmintic drugs.

Fecal Examination

The fecal samples were examined using the following techniques:

Differential Floatation Technique: This method was employed to identify the eggs of nematodes and cestodes. The floating media employed was a 0.9% sodium chloride solution, and the eggs were recognized by their morphological features.

Sedimentation Technique: The observation of trematode eggs was done using this method. Methylene blue staining of the sediment was done, and it was studied under a microscope.

Direct Smear Method: The identification of helminth larvae was accomplished using this technique. The larvae were recognized by their morphological characteristics after a little volume of physiological saline solution was combined with the fecal sample.

Statistical Analysis

Data were analyzed using GraphPad version 5. The prevalence of different helminth parasites was calculated using the following formula:

Prevalence (%) = (Number of positive samples / Total number of samples examined) × 100

Table 3.1: Different characteristics and parameters used in studying helminthes in selected Buffalo population

S. No	Name	Domesticated Buffaloes	Farmed Buffaloes
1	Specie	*Bubalus bubalis* (Buffaloe)	*Bubalus bubalis* (Buffaloe)
2	Sex	Female	Female
3	Age	36 months (3 years Adult)	36 months (3 years Adult)
4	Weight	350 Kg	350 Kg
5	Health Condition	Physically Healthy Looking	Physically Healthy Looking
6	Feeding Habit	Meadow grass, Open Pastures and drinking from Damp and rivers	Specially Prepared fodder containing a mixture of proteins and other nutrient requirements along with seeds for energy rich oil
7	Medication	No	Yes
8	Name of Medication	Nil	i. Nilzan LV Oral Drench ii. Decovas DDUP Spray
9	History of Vaccination	No	Yes
10	Name of Vaccines	Nil	Ivomiec (1%) S.C Injection

RESULTS

The current study was conducted to compare the incidence of Helminth Parasites in domesticated and Farmed Buffaloes of District Peshawar through coprological examination from June to September, 2022. Seven species of Intestinal Helminth Parasites were identified. A total of 200 fecal samples were collected. 100 from domesticated and 100 from farmed buffaloes of district Peshawar. For collection of samples random locations of different areas of district Peshawar were selected. In comparing the infection among domesticated and farmed buffaloes it was recorded to be (22 %) for domesticated while (2 %) was for farmed buffaloes (Table 4.1). A higher degree of infection was found in house domesticated old buffaloes.

Table No. 4.1 Comparison of Infection by Helminthes Parasites among ho Domesticated and Farmed Buffaloes in District Peshawar

S. No	Helminth	Parasite Egg identified	Domesticated Buffaloes Total 100		Farmed Buffaloes Total 100	
			Positive	%age	Positive	%age
1.	Nematode	*Mecistocirrus digitatus*	3	3 %	0	0 %
		Oesophagostomum radiatum	1	1 %	0	0 %
2.	Trematode	*Fasciola hepatica*	5	5 %	1	1 %
		Fischoederius cobboldi	7	7 %	0	0 %
		Gastrothylax crumenifer	4	4 %	1	1 %
		Fasciola gigantica	1	1%	0	0 %
		Fasciola hepatica + Carmyerius spatiosus	1	1 %	0	0 %
	TOTAL		22	22 %	2	2 %

Fig 4.1 Comparison of Helminth Parasites among Domesticated and Farmed Buffaloes in Peshawar

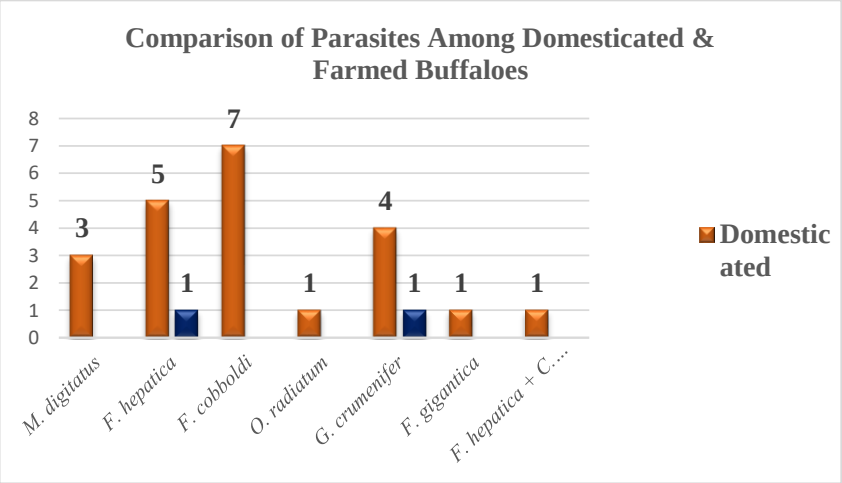


Table 4.1 shows that domesticated buffaloes were highly infected by *Fischoederius cobboldi*. The infected samples found positive for *Fischoederius cobboldi* were 7 with an infection rate of (7 %). The number of infected samples for *Fasciola hepatica, Gasrothylax crumenifer, Mecistocirrus digitatus, Oesophagostomum radiatum,* and *Fasciola gigantica* were 5, 4, 3, 1 and 1 with an infection rate (5 %), (4 %), (3 %), (1 %) and (1 %) respectively. The lowest infected sample was found to be that of *Oesophagostomum radiatum* and *Fasciola gigantica* with an infection rate (1 %).
Additionally there was a mixed infection in 1 sample containing an infection of *Fasciola hepatica* and *Carmyerius spatiosus* with an infection rate of (1 %).

Fig 4.2. Percentage of Helminthic Infection among Domesticated Buffaloes in Peshawar

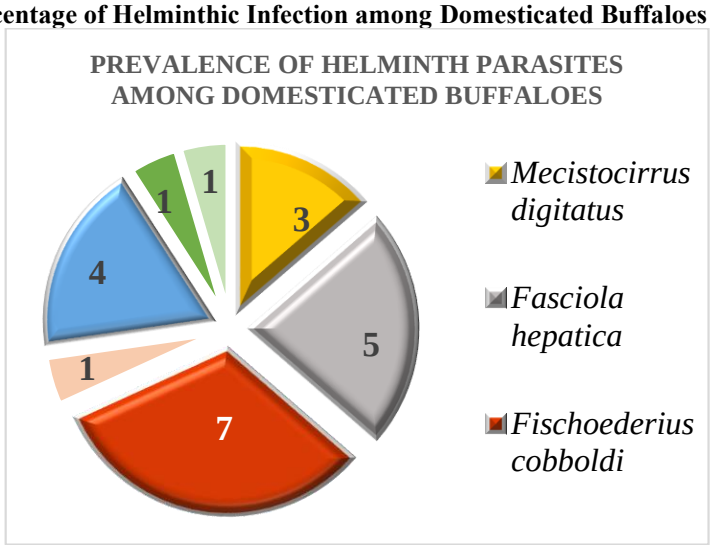
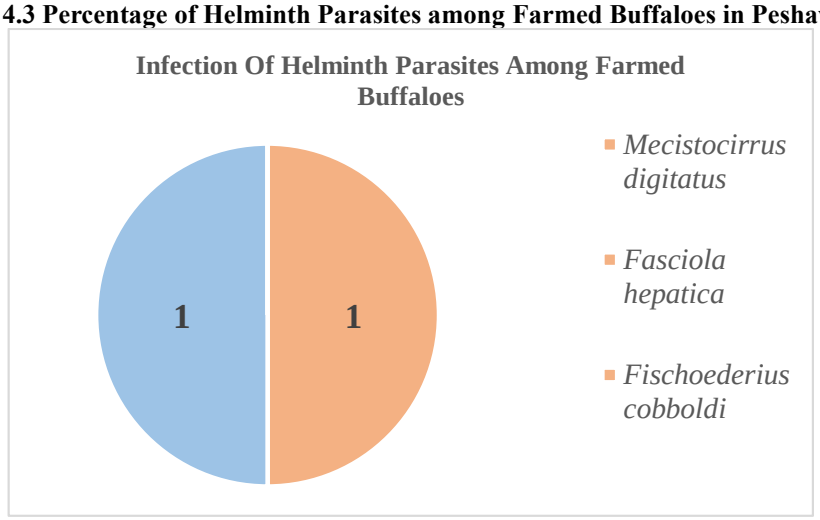


Fig 4.3 Percentage of Helminth Parasites among Farmed Buffaloes in Peshawar



A total of 100 fecal samples were tested from 6 different farms. Among these only 2 fecal samples were found to be positive for *Fasciola hepatica* and *Gastrothylax crumenifer* with an infection rate of (1 % each) (Table 4.2).

Tab No. 4.2 Overall Comparison of Infection by Helminth Parasites among Domesticated and Farmed Buffaloes in District Peshawar

S.No	Source of samples	Total Samples	Positive	%age	Negative	%age
1	Domesticated Buffaloes	100	22	22 %	78	78 %
2	Farmed Buffaloes	100	2	2 %	98	98 %

Fig 4.4 Overall Comparison of Infection by Helminth Parasites among Domesticated and Farmed Buffaloes in District Peshawar.

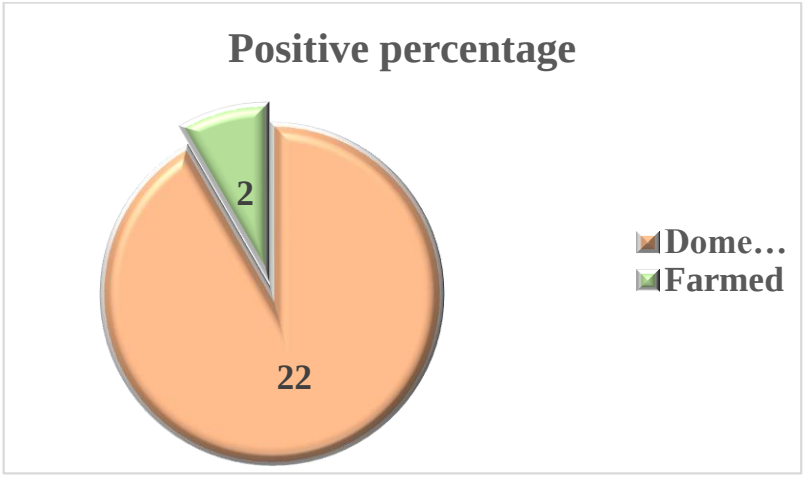


Fig 4.5 A Microscopic view of *Gastrothylax crumenifer* (Magnification 40X)

Fig 4.6 A Microscopic view of *Fischoederius cobboldi* (Magnification 40X)

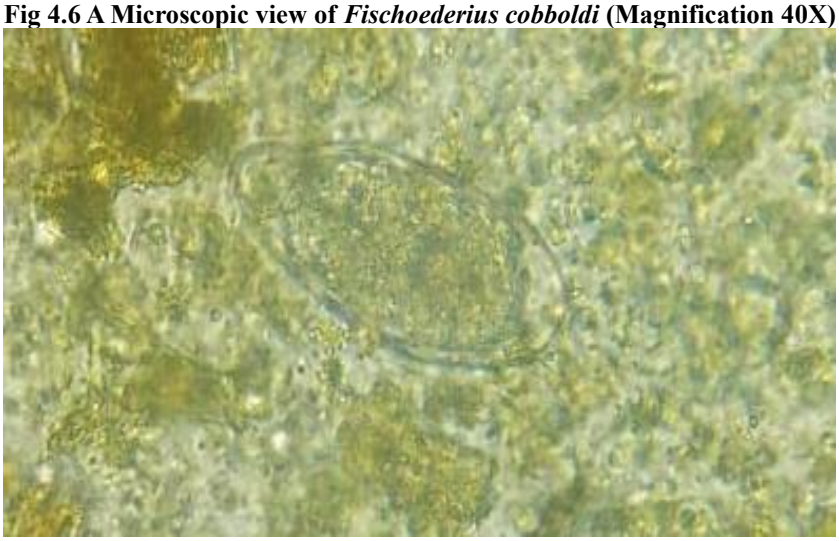


Fig 4.7 A Microscopic view of *Fischoederius cobboldi* (Magnification 40X)

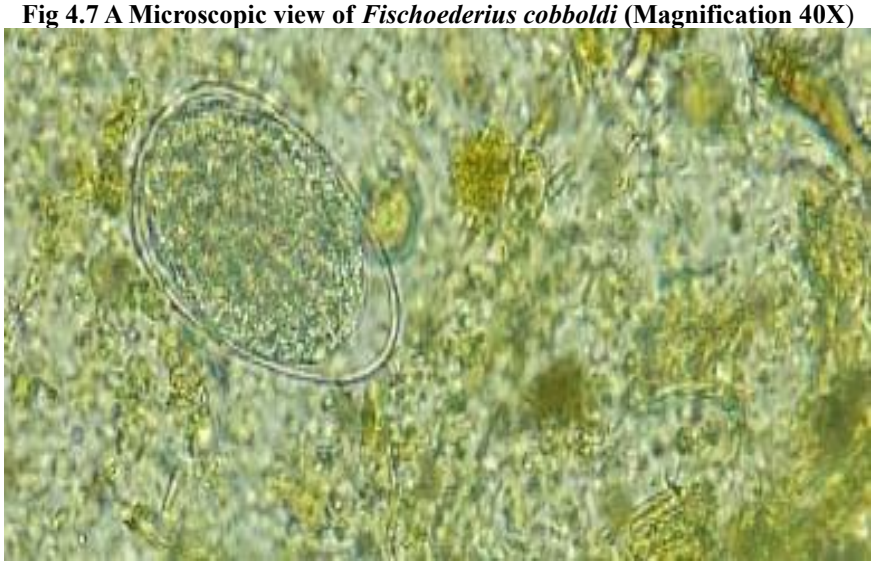


Fig 4.8 A Microscopic view of *Oesophagostomum radiatum* (Magnification 40X)

Fig 4.9 A Microscopic view of *Mecistocirrus digitatus* (Magnification 40X)

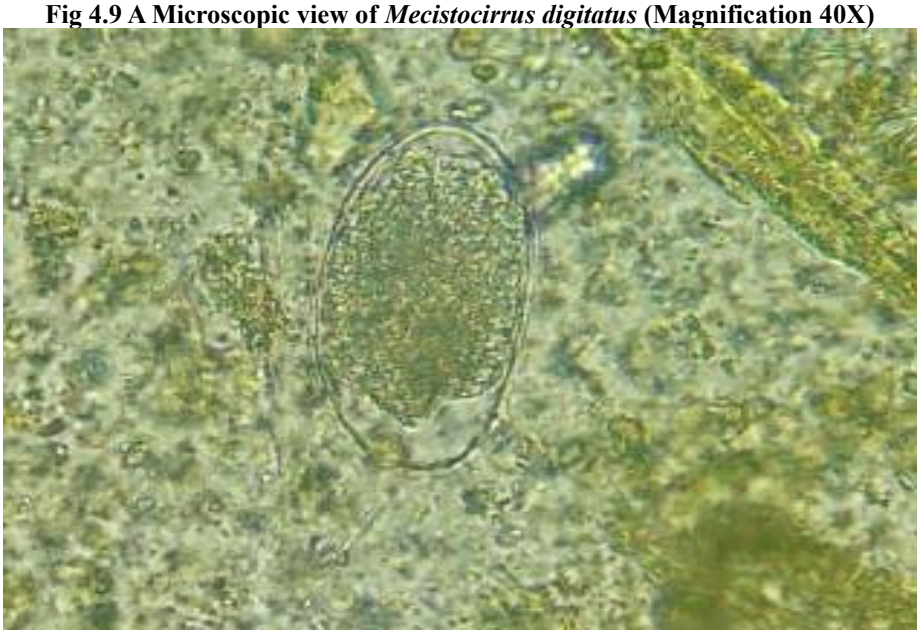


Fig 4.10 A Microscopic view of *Mecistocirrus digitatus* (Magnification 40X)

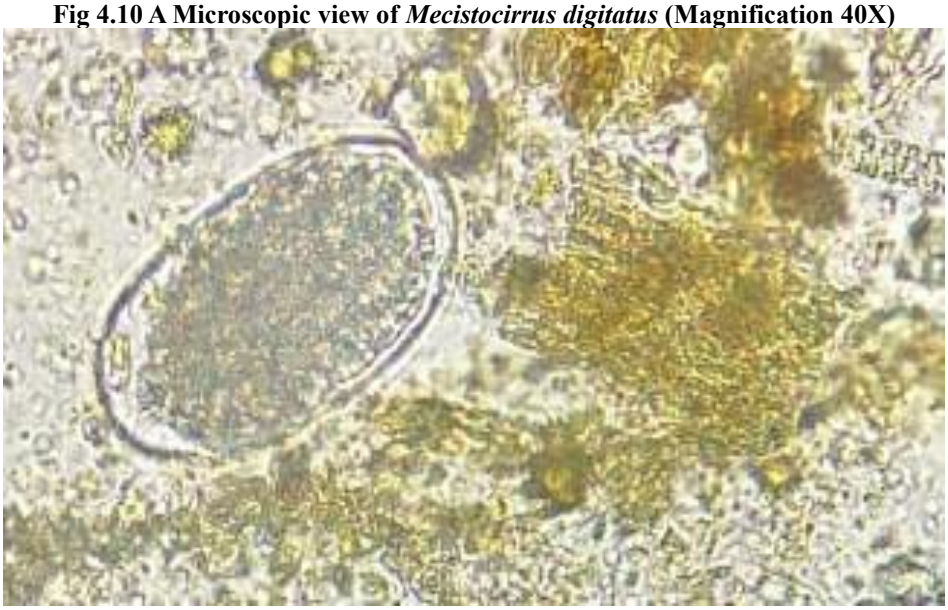
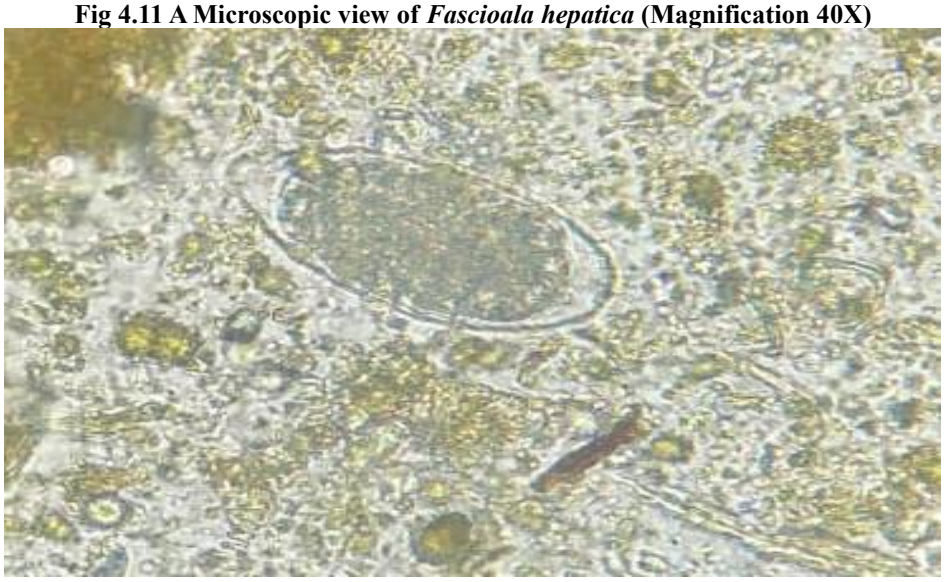


Fig 4.11 A Microscopic view of *Fascioala hepatica* (Magnification 40X)



Tab 4.3 Different Parameters of Domesticated and Farmed Buffaloes

S. No	Name	Category	Domesticated Buffalo	Farmed Buffalo
1.	Age in months	31-36	15	2
		37-42	7	Nil
2.	Weight in Kg	320-370	13	1
		371-420	9	1
3.	Feeding Habits	Fodder	No	Yes
		Pasteur	Yes	No
4.	Drinking Water	River/damp water	Yes	No
		Tube well water	Yes	No
5.	Medications		No	Yes
6.	Vaccinations		No	Yes

Discussion:

There are a number of reasons why domesticated buffaloes have a greater frequency of helminth infections than farmed buffaloes, including management techniques, deworming initiatives and farmer knowledge. Due to their primary reliance on open pasture grazing and tainted water sources, domesticated buffaloes in the research region were more likely to come into contact with infectious stages of helminth parasites. In contrast, the risk of illness was lower for farmed buffaloes because they received clean drinking water and specifically prepared feed.

The results of this investigation are in line with other data from Pakistan and other nations, which have shown that domesticated or free-range cattle had a greater frequency of helminth infections than well-managed farm animals (6, 7).

The most common helminth parasites found in farmed buffaloes were the liver fluke *Fasciola hepatica* and the trematod *Fischoederius cobboldi*, which is consistent with other research done in comparable conditions (8, 9). Because of their propensity to cause liver damage, stunted development, and decreased output, these trematod infections can result in large financial losses (10).

The adoption of appropriate management methods, such as the routine use of anthelmintic medications and preventative measures, can be credited with the decreased occurrence of helminth infections in buffaloes raised for food. However, the discovery of *Gastrothylax crumenifer* and *Fasciola hepatica* in a small number of domesticated buffaloes highlights the necessity of ongoing surveillance and management initiatives.

Conclusions:

The results of this study show that domesticated buffaloes in Peshawar, Pakistan had a higher frequency of helminth infections than farmed buffaloes. There are a number of variables that contribute to the greater infection rates in domesticated buffaloes, including open grazing, contact with polluted water sources, and the absence of deworming procedures.

The use of appropriate management methods, such as improved housing conditions, regulated grazing, frequent deworming programmes, and farmer awareness campaigns, is necessary in order to offset the economic impact of helminth infections on livestock output. To create focused therapies and reduce related economic losses, more study on the epidemiology and management of helminth infections in buffaloes is also necessary.

Study Limitations

i. In this study, no cestodes were found, which might be due to their small size and the seasonal impact at the time of sampling.

ii. Another reason might be missing the diagnostic techniques which are specific for the identification of cestodes.

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