Research Article

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Diagnostic Study of Gastrointestinal Parasites in Buffaloes in Mosul City, Iraq

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Abstract

Gastrointestinal parasites (GIP) are often associated with diarrhea in buffaloes, which affects health, growth, and production. They are also sources of infestation in the herd, nearby herds, and grazing areas. The current study aims to diagnose the different types of GIP that infect buffaloes in the Mosul city, Iraq, and to determine their infestation rate. A total of 100 fecal samples were randomly collected from buffaloes of different ages (ranging from 1.5 to 5 years old) and both sexes in various regions of Mosul city. These samples were examined using direct smear technique, with or without iodine dye, flotation method, and sedimentation method, with or without methylene blue dye, between September 2022 and February 2023. The overall infestation rate with GIP was 59%, comprising intestinal protozoa (56%), Nematodes (6%), and Trematodes (2%). That included *Buxtonella sulcata* (56%); *Trichostrongylus spp.* (3%); *Haemonchus spp.* (1%); *Cooperia spp*. (1%); *Ostertagia ostertagi.* (1%); and *Fasciola hepatica* (2%). Moreover, a variation in the infestation rates according to the months of collected samples was observed; significantly ($P<0.05$) highest infestation rate was recorded in February at 93.3%, followed by November at 82%, and the lowest infestation rate was recorded in October and September at 16% and 36.3%, respectively. In conclusion, the highest infestation rate with GIP in buffaloes in the city of Mosul, Iraq, this must be given increased attention by owners and veterinarians for strategical control of these parasites.

Key words: Parasites, Buffaloes, Mosul city, GIP.

Introduction

The buffalo is an important indigenous livestock species in Iraq that produces dairy products, meat, and fertilizer. There are more than 170 million water buffaloes in the world, with the majority of them found in Asia, Africa, South America, and southern Europe (1). The Asian buffalo, being the most abundant and milk-producing breed, highlights the significance of parasitic diseases that affect buffaloes, which are just as crucial as other infectious diseases (2). The buffalo is characterized by a dark gray or black color. It is a common color for buffalo in Iraq and the Arab countries because the Iraqi buffalo is of Indian origin, and this type is resistant to many diseases and has the ability to adapt and withstand difficult conditions (3). Buffaloes have adapted to live in different environmental conditions in Iraq. The majority of buffaloes live in the southern 60% and central 37% regions. There are fewer buffaloes in the northern regions, such as the Dohuk and Sulaymaniyah governorates, which are mountainous and less suitable for raising buffaloes. The Badush regions in Nineveh governorate have the highest number of buffaloes, with approximately 8,000 heads, representing 15.6% of the total number of buffaloes in Iraq (4). Variation in the prevalence and severity of parasites depends on geographic locations, environment, immune and nutritional status, the presence of an intermediate host, and the number of infected larvae or eggs ingested by animals. Internal parasites negatively affect the health and productivity of animals and also reduce the animals' resistance to various diseases, which may ultimately lead to mortality (5). Among the most important parasitic diseases spread in Iraq that affect buffalo are *Buxtonella sulcata*, *Eimeria spp*., *Fasciola hepatica*, *Giardia spp*., *Cryptosporidium spp*., Nematodes, and Trematodes (6-10). The importance of these parasites in field animals lies in the economic losses they cause resulting from poor animal health, lack of fertility, delay in the growth of infected animals, and low levels of disease. On the one hand, production is high, and on the other hand, processing costs are one of the important problems facing those responsible for developing and caring for livestock (11). In Iraq, many types of Gastro intestinal worms have been diagnosed in buffaloes in different governorate of Iraq, including Babylon, Diwaniyah, and Thi Qar (12-14).

There are currently few studies and data regarding the GIP infestation of buffalo in Mosul. Therefore, the purpose of the current study is to identify the various of GIP species that infect buffaloes in Mosul, Iraq, as well as determine the infestation rate of these parasites.

Materials and Methods

Samples collection and examination

During the period from September 2022 to February 2023, one-hundred fecal samples were collected randomly from local buffaloes, from both sexes and ages ranged from 1.5 to 5 years old. About 10-15 grams of feces were directly collected from the rectum using (nylon gloves) from each buffalo and then placed in special plastic container. The necessary data, such as the sample number, time, date, and place of the

samples were written, then transferred to the laboratory at the College of Veterinary Medicine/University of Mosul. A microscopic examination of the feces samples was carried out for detection of the GIP using direct smear with or without iodine dye to detect parasite oocytes and eggs in the feces (15, 16), floatation method was used to detect roundworm eggs as well as some protozoa cysts (17), and sedimentation with or without methylene blue dye to detect eggs of Trematode worms as well as intestinal protozoa (18, 19).

Statistical Analysis

The data was tested and analyzed using the two-sided Chi-square and Fischer's exact test in the IBM-SPSS Statistics (Version 22) program., and the results were considered significant at the P≤0.05 level.

Results

In the present study, the overall infestation rate with GIP in buffaloes was 59%, comprising a significantly (P<0.05) higher protozoa infestation that was 56%, compared to Nematodes and Trematodes infestations of 6% and 2%, respectively (Table 1). Moreover, one type of protozoa; *Buxtonella spp*. was reported in buffaloes (Table 1) and (Figure 1), four types of Nematodes; *Trichostrongylus spp*., *Ostertagia ostertagi*, *Haemonchus spp*., and *Cooperia spp.* were reported in buffaloes (Figure 2), and one type of Trematodes; *Fasciola hepatica* was reported in buffaloes (Figure 3) and (Table 2) respectively.

Table (1): Infestation rate of GIP in buffaloes in Mosul city (n=100).

GIP types	Number of examined samples	Number of infected animals	Infestation rate %
Trematode	100	2	2^a
Nematode		6	6^a
Protozoa		56	56^b
Total		59	59

The difference in the letters (a, b) means that the values differ significantly under the probability level (P≤0.05).

Table (2): Infestation rates of the type of protozoa, Nematodes and Trematodes in buffaloes (n=100).

GIP types	Number of infected animals	Infestation rate %
Buxtonella spp.	56	56
Trichostrongylus spp.	3	3
Ostertagia ostertagi	1	1
Cooperia spp.	1	1
Haemonchus spp.	1	1
Fasciola hepatica	2	2

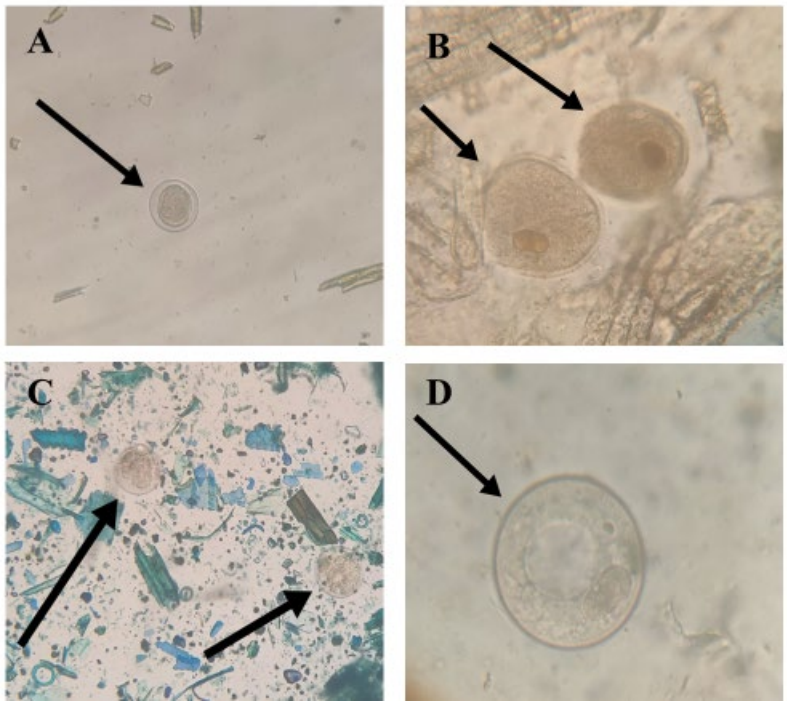

Figure (1): Eggs of intestinal protozoa. Where images (a) and (b) represent *Buxtonella sulcate* in the cyst stage under 10X and 40X magnification, respectively. (c) Image of *Buxtonella sulcata* with 10X methylene blue stain. (d) Image of active phase *Buxtonella sulcata* under 40X magnification.

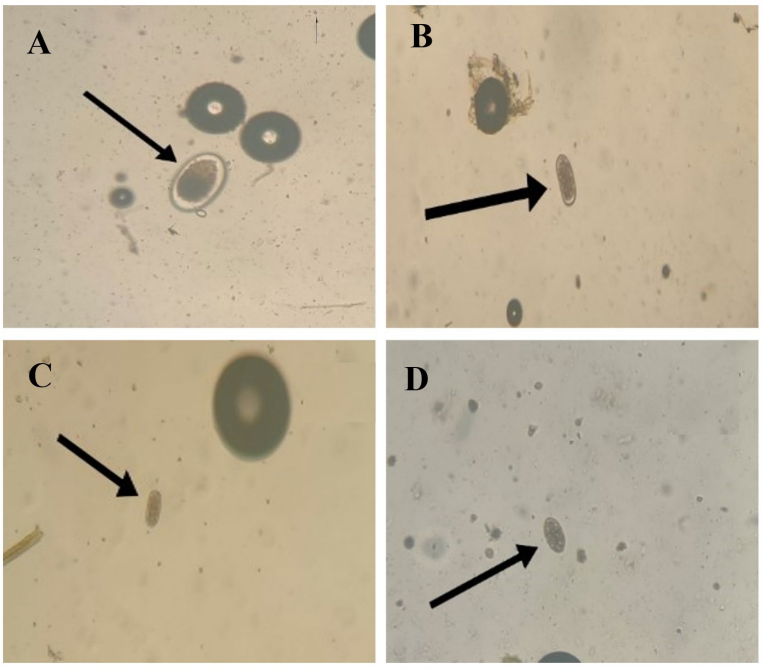

Figure (2): Eggs of Nematodes. Image of (a) *Ostertagia ostertagi*, (b) *Trichostrongylus spp*, (c) *Cooperia spp*. and (d) *Haemonchus spp.* showing roundworm eggs under X10 magnification.

Figure (3): Eggs of Trematodes. The microscope image displays a *Fasciola hepatica* egg under 40X magnification.

In addition, results of the present study showed that the infestation rate of GIP was significantly different (P<0.05) between months; that was significantly higher in February 2023, at 93.3%, followed by November 2022, at 82%, compared to October and September 2022, at 16% and 36.3%, respectively (Table 3).

Table (3): Infestation rate of GIP in buffaloes according to the sampling months of the study

Months	Number of examined animals	Number of infected animals	Infestation rate %
September 2022	22	8	36.3[a]
October 2022	25	4	16[a]
November 2022	23	19	82[b]
February 2023	30	28	93.3[b]
The total	100	59	59

The difference in the letters (a, b) means that the values differ significantly under the probability level (P≤0.05).

Discussion

This recent study focused on the detection of GIP that infect buffalo in Mosul City, Iraq. As there is limited information available about GIP, it can be difficult to find comprehensive details about them. Globally, much research has been conducted on the infestation of buffaloes with parasites because according to the latest statistics of the Food and Agriculture Organization of the World at 2008, which estimated the number of buffalo in the world at 185.29 million, distributed in about 42 countries, of which 179.75 million (97%) are in Asia (20). GIP infestations commonly affect buffaloes, particularly calves, resulting in significant economic losses for the industry

and farming communities due to mortality in infected young animals and reduced weight gain (21).

According to the results of this recent study, the total rate of infestation with GIP among buffalo in Mosul city was found to be 59%. In a separate study conducted (12), the rate of infestation with GIP was reported to be 74% in Diwaniyah Governorate. Another study mentioned in Thi-Qar reported a rate of 23.71% (13). Globally, researchers have recorded that buffaloes in Pakistan have a 68.67% rate of infestation with GIP, which is considered high on a global scale (22), and (63.81%) in the eastern Sumba region in Indonesia (23). Variation in the rate of GIP infestation across the world can be attributed to several factors, including differences in animal physiology, age, breed, climate, environmental conditions, animal husbandry practices, field cleanliness, and the impact of global climate change over the past few decades. Other potential factors may include variations in sample size or sampling area. Despite these factors, the overall trend is consistent with previous research on the topic (12).

The study showed that the infestation rate with intestinal protozoa was 56%, represented by only one species, *Buxtonella sulcata*. This rate is considered high if compared with the rate of infestation with other parasites, and this may be due to that these intestinal protozoa spread through contamination of water and feed with the feces of animals containing the cysts of these parasites (24). Furthermore, (13) reported that the total percentage of infestation with *Buxtonella sulcata* was (35%) in fecal samples collected from buffaloes in different regions of Mosul city in 2013. In contrast, total infestation buffaloes with GIP was 38.5% as following: *Eimeria spp.* 16 %, *Cryptosporidium spp.* 10% and *Giardia duodenalis* 12.5% in the Babylon city, Iraq (14).

During the study, it was found that the infestation rate with Nematodes was 6%, which is higher than the infestation rate caused by Trematoda 2%. However, there was no case of infestation with Cestode recorded. During their study, (12) identified *Moniezia spp.* eggs in two fecal samples (1.26%) in Al-Diwaniyah Governorate.

On the other hand, (26) observed worm incidence in Samarra city, Iraq: 85% Nematodes, 10% Cestodes, and 5% Trematode. In Diwaniyah Governorate, a study conducted by (12) recorded the infestation rates of several species of Nematodes. The results showed that *Cryptosporidium spp.* had an infestation rate of 20.63%, *Trichostrongyldae* had a rate of 7.56%, *Trichuris spp.* had a rate of 3.78%, and *Toxocara vitulorum* had a rate of 0.63%. In another study conducted by (23) the prevalence rates of GIP were recorded. The results showed that the infestation rates were 13.33% for Nematodes, 1.90% for Cestodes, and 9.52% for Trematodes. In addition, this recent study recorded one type of Trematodes, which was *Fasciola hepatica* with a rate (2%), while (12) recorded one type of Trematodes in Al-Diwaniyah Governorate, with a rate (3.15%).

The results of this study showed a difference in the rates of infestation with GIP during the months of the collection of samples. The highest infestation rate was recorded in February at 93.3%, followed by November

at 82%, and the lowest infestation rate was recorded in October and September at 16% and 36.3%, respectively. However, low temperatures affect the process of hatching parasite eggs and thus delay the parasite's life cycle (27), but a high incidence of infestation was recorded. Maybe the reason is that most of the infestations in February were caused by intestinal protozoa because all of the animals examined were indoor rearing and the presence of young animals with older animals, which were the main source of infecting calves with intestinal protozoa, in addition to the rainfall in this month. That is, there is a noticeable increase in the infestation rate in cold, rainy climates compared to warm climates, in agreement with (12, 21, 28) they also recorded high infestation rates in the same climates.

There are various factors that can contribute to variations in the rate of parasitic infestations among buffaloes. These include the severity of the infestation, time of examination, the breed of the buffalo and some of these factors may have a combined effect or act independently, thereby increasing the risk of the spread and transmission of parasites among the animals (28).

Conclusions

The results of this recent study identified the highest infestation rate was represented by intestinal protozoan parasites, followed by Nematodes and Trematode as well as a significant increase in the infestation rate in February, followed by November, compared to September and October.

Conflict of interest: All authors declare that there is no conflict of interest.

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دراسة تشخيصية لطفيليات المعدة والامعاء في الجاموس في مدينة الموصل، العراق

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الخلاصة

غالبًا ما ترتبط الطفيليات المعدة والأمعاء بالإسهال في الجاموس، مما يؤثر على الصحة والنمو والإنتاج. كما أنها تعتبر مصادر للإصابة في القطيع، والقطعان المجاورة، وكذلك مناطق الرعي. تهدف الدراسة الحالية إلى تشخيص أنواع مختلفة من طفيليات المعدة والأمعاء التي تصيب الجاموس في مدينة الموصل، العراق، وتحديد نسبة الإصابة بها. تم جمع 100 عينة براز بشكل عشوائي من جاموس بأعمار مختلفة (تتراوح ما بين 1.5 إلى 5 سنوات) ومن كلا الجنسين في مناطق مختلفة من مدينة الموصل. تم فحص هذه العينات باستخدام تقنية المسح المباشر، مع أو بدون صبغة اليود، وطريقة الطفو، وطريقة الترسيب، مع أو بدون صبغة الميثيلين الزرقاء، في الفترة ما بين سبتمبر 2022 وفبراير 2023. حيث أظهرت النتائج ان معدل الإصابة الإجمالي الطفيليات المعدة والأمعاء كان 59%، بما في ذلك الأوليات المعوية 56%، والديدان الخيطية (6%)، والديدان المثقوبة (2%). وشمل ذلك *Buxtonella sulcata* (56%)، *Trichostrongylus spp.* (3%)، *Haemonchus spp.* (1%)، *Cooperia spp.* (1%)، Ostertagia ostertagi (1%)، و Fasciola hepatica (2%). علاوة على ذلك، لوحظ تباين في معدلات الإصابة حسب أشهر جمع العينات وبشكل ملحوظ سجلت أعلى نسبة إصابة في شهر فبراير بنسبة 93.3%، يليه شهر نوفمبر بنسبة 82%، وأقل نسبة إصابة سجلت في شهري أكتوبر وسبتمبر بنسبة 16% و36.3% على التوالي. نستنتج من ذلك أن نسبة إصابة طفيليات المعدة والأمعاء في الجاموس في مدينة الموصل بالعراق كانت عالية، لذلك يجب الاهتمام المتزايد من قبل المالكين والأطباء البيطريين لعمل إستراتيجية للسيطرة على هذه الطفيليات.

الكلمات المفتاحية: الطفيليات، الجاموس، مدينة الموصل، GIP.