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PREVALENCE OF HELMINTHES OF SHEEP IN ASSIUT GOVERNORATE, EGYPT

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ABSTRACT

The prevalence of helminthes of sheep concerning age, sex, and seasonal variation (the cold and temperate seasons including all months of the year except July and August, were studied in Assiut Governorate, Egypt from February 2022 to January 2023. Fecal examination of 100 sheep revealed 47 (47%) were positive. Mixed infection with at least two species of helminth parasites was recorded. Five genera of helminthes were identified. Of them, three genera were nematodes, namely, *Strongyle spp*. (33%), *Strongyloides papillosus* (32%), and *Trichuris ovis* (5%); one genus was trematodes, namely, *Paramphistomum cervi* (7%); and one genus was cestodes, namely, *Moniezia spp* (2 %). The prevalence of helminthes was higher in young sheep aged < 2 years (60.4%) than in adults aged > 2 years (34.6%). Prevalence of helminthes in females was higher (47.1%) than in males (46.7%). Regarding seasonal variation, the prevalence of helminthes was significantly higher in the cold and temperate season (47%) than in the hot seasons (July and August) (0%). A higher prevalence of helminth infection during the cold and temperate season might be due to high humidity, which flourishes the development and growth of the larval stage and intermediate host in pasture, whereas in the hot season, dryness led to killing larval stage and intermediate host. We recommend increasing the prevention and treatment of parasitic infestation during cold and climate seasons by veterinarians to keep higher production of farm animals.

Keywords: Prevalence, Helminthes, Sheep, Assiut.

INTRODUCTION

Sheep form an important component of the rural economy by their multi-facet utility for wool, meat, milk, skins, and manure, especially in the arid, semi-arid, and mountainous areas of the country, as it provides the shepherds with a dependable source of income through the sale of wool and animals (Osman *et al.*, 2018). Parasitism is one of the main problems decreasing live-stock production. Not only by mortality which may not be alarming at times, but also by decreasing production of milk, meat, wool, hide production, infertility, loss of stamina of working animals, and some of the parasitic infection can be transmitted to humans (zoonotic importance) (Kabir *et al.*, 2010). Helminthes infection decreases the immunity of animals, making it more susceptible to other pathogenic infections (Saber, 2011). Abdelhamid *et al.* (2021) stated that there is a harmful effect on the hematological, biochemical and hormonal parameters of Soviet Merino sheep when it was affected by combined monieziosis and hypomicroelementosis, the distinguished helminthes classes were nematodes

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(roundworms), cestodes (tapeworms), and trematodes (flukes) (Farooq *et al.*, 2012). There are many predisposing factors affecting helminthes infections, including climatic condition, grazing habits, deficiency of some nutrients, management of pasture, immunity, presence of vectors and intermediate hosts, and presence of infective larvae and eggs in the environment (Edosomwan & Shoyemi, 2012). Gastrointestinal nematodes infection is one of the main causes limiting the global livestock production on pasture, either by death of animals or indirectly by reduction in production through decreased feed intake (Dyary, 2018). The pathogenesis of gastrointestinal nematodes may be subclinical or clinical, it may lead to severe blood and protein loss into the abomasum and intestine, which often results in submandibular edema (Pugh & Baird, 2012). Younger animals are more susceptible (Tamiru, 2018). Several studies in Egypt were done to study the prevalence of helminth parasites in different Governorates in Egypt, including studies by (Elseify *et al.*, 2021) in Sohag, (El Hadid *et al.*, 2007) in Beni-Suef, (Al-gaabary *et al.*, 2012) in Gharbia, (Sultan *et al.*, 2016) in Kafr El-Sheikh, and (Menshawy *et al.*, 2011) in Beheira.

To our knowledge, few studies were done on the prevalence of helminthes in sheep with the seasonal variation of infection in Assiut Governorate. Therefore, the aim of the present study is to identify helminthes parasites and identification of prevalent species and seasonal dynamics of helminth eggs by sedimentation, and flotation techniques.

MATERIALS AND METHODS

1. Ethical approval: This study was reviewed and approved by the ethics which committee of Assiut University, in March 2023.

2. Study area: The present study is cross sectional study which was conducted during the period from February 2022 to January 2023 in Assiut Governorate (27.252ºN 31.01ºE) which located in Upper Egypt. Assiut province has a desert climate and several districts were such as Arab el-madabegh, Al-wilidiyyah, Derenkah and Awlad-ibrahim as in Fig. 1.

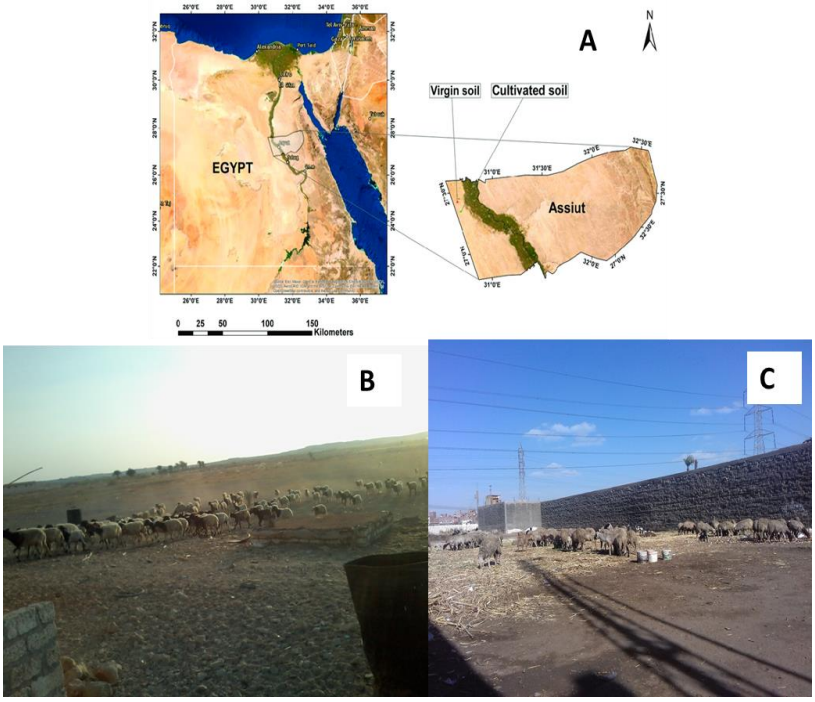

Fig. 1. A: Assiut city map, (B& C): Different studied districts in Assiut Governorate.

3. Sample collection: A total of 100 fecal samples (Each sample1-6 gm in size according to the consistency) were collected directly from the rectum of sheep in sterile screw capped plastic cups which was labeled with the full data about each animal (sex, weight, age, locality and season), then the cups were transported to the Parasitology lab at the Faculty of Veterinary Medicine, Assiut University. The fecal samples were examined directly by fecal smear, and stored at 4˚C for further sedimentation and flotation techniques.

4. Fecal examination: the samples were examined via direct smear, concentration techniques including (sedimentation and flotation technique), the used solution is saturated salt solution and zinc sulfate, the samples were centrifuged at 2000 rpm for 2-3 min, and examined by (x40) lens (Kaufmann, 1996).

Statistical analysis: The collected data in the present study were introduced into Excel spreadsheets (Windows 2010) and were analyzed using Statistical Package for Social Sciences (SPSS) software program (version 26). The qualitative variable was recorded as frequencies and percentages and was compared by the chi-square test. The quantitative measure was presented as means ± standard deviation (SD) and Median (Interquartile range). P value < 0·05 was significant while P value of < 0.01 was highly significant.

RESULTS

The obtained helminthes eggs in sheep were shown in Table 1, where the rate of infection with *Paramphistomum cervi* was (7%). For *Moniezia spp*., the infection rate was (2%). The infection rate of *Strongyle spp*. eggs were (33%). For *Strongyloides papillosus*, the infection rate was (32%) and the infection rate for *Trichuris ovis* was (5%). (Table 1).

Table 1: Prevalence of helminth infection in sheep.

Type of parasite	Total=100	
	Infected no	**%**
parasitic infection	47	47.0
1)Trematodes	**7**	**7.0**
-Paramphistomum cervi	7	7.0
2)Cestodes	**2**	**2.0**
***-Moniezia* spp.**	2	2.0
3)Nematodes	**38**	**38.0**
-Trichuris ovis	5	5.0
***-Strongyle spp.* eggs**	33	33.0
-Strongyloides papillosus	32	32.0

1. Concerning age group: young sheep at age <2 years had a higher prevalence of infection (60.4%) than adult animals at age > 2 years (34.6%). There was a significant relationship between *strongyle* infection in sheep by age (P<0.05). The prevalence of helminthes in lambs was the highest in the case of *Strongyle spp*. egg (43.8%) followed by that *Strongyloides papillosus* (39.6 %), *Paramphistomum cervi* (10.4%), *Trichuris ovis* (6.3%), and *Moniezia spp*. (2.1%). Prevalence of helminthes in adults was the highest in the case of *Strongyloides papillosus* (25%) followed by that *Strongyle spp*. egg (23.1%), *Trichuris ovis* (3.9%), *Paramphistomum cervi* (3.8%), and *Moniezia spp.* (1.9%). (Table 2).

Table 2: Prevalence of helminth infection in sheep in relation to age.

Type of parasite	Ex. Animal (< 2 year) =48		Ex. Animal (> 2 year) =52		Total=100		P. value
	Infected no	%	Infected no	%	Infected no	%	
1)Trematodes	**5**	**10.4**	**2**	**3.8**	**7**	**7.0**	0.198
Paramphistomum cervi	5	10.4	2	3.8	7	7.0	0.198
2)Cestodes	**1**	**2.1**	**1**	**1.9**	**2**	**2.0**	0.954
***-Moniezia* spp.**	1	2.1	1	1.9	2	2.0	0.954
3)Nematodes	**23**	**47.9**	**15**	**28.8**	**38**	**38.0**	0.050
-Trichuris ovis	3	6.3	2	3.9	5	5.0	0.582
***-Strongyle spp.* eggs**	21	43.8	12	23.1	33	33.0	**0.028***
-Strongyloides papillosus	19	39.6	13	25.0	32	32.0	0.118

* Statistically significant difference (p<0.05)

2. Concerning the sex: prevalence of helminthes in female sheep was higher (47.1%) than in males (46.7%). There was no significant relationship between helminth infection in sheep by sex (P>0.05). In females, the prevalence was the highest in the case of *strongyle spp*. eggs (31.4%) followed by that *Strongyloides papillosus* (28.6%), *Paramphistomum cervi* (8.6%), *Trichuris ovis* (5.7%), and *Moniezia spp*. (2.9%). In the male, the prevalence was the highest in the case of *Strongyloides papillosus* (40%) followed by that *strongyle spp*. eggs (36.7%), *Trichuris ovis* (3.3%), and *Paramphistomum cervi* (3.3%), but no cestodes infection was detected in male sheep. (Table 3).

Table 3: Prevalence of helminth infection in sheep in relation to sex.

Type of parasite	Examined male=30		Examined female=70		Total=100		P. value
	Infected no	%	Infected no	%	Infected no	%	
1)Trematodes	**1**	**3.3**	**6**	**8.6**	**7**	**7.0**	0.347
Paramphistomum cervi	1	3.3	6	8.6	7	7.0	0.347
2)Cestodes	**-**	**-**	**2**	**2.9**	**2**	**2.0**	0.350
***-Moniezia* spp.**	-	-	2	2.9	2	2.0	0.350
3)Nematodes	**13**	**43.3**	**25**	**35.7**	**38**	**38.0**	0.472
-Trichuris ovis	1	3.3	4	5.7	5	5.0	0.617
***-Strongyle spp.* eggs**	11	36.7	22	31.4	33	33.0	0.610
-Strongyloides papillosus	12	40.0	20	28.6	32	32.0	0.262

No Statistically significant difference (P >0.05).

3. Concerning the seasonal variation: the prevalence of helminth infection was highly significant in cold and temperate season (47%) and negative in hot season (including July and August). In cold and temperate season, prevalence was the highest in case of *strongyle spp*. eggs (58.9%) followed by that of *Strongyloides papillosus* (57.1%), *Paramphistomum cervi* (12.5%), *Trichuris ovis* (8.9%), and *Moniezia spp.* (3.6%). (Table 4).

Table 4: Prevalence of helminth infection in sheep in relation to seasonal variations.

Type of parasite	Cold &Temperate season Examined no.=56		Hot season Examined no.=44		Total=100		P. value
	Infected no	%	Infected no	%	Infected no	%	
1)Trematodes	**7**	**12.5**	**-**	**-**	**7**	**7.0**	**0.015***
Paramphistomum cervi	7	12.5	-	-	7	7.0	**0.015***
2)Cestodes	**2**	**3.6**	**-**	**-**	**2**	**2.0**	0.205
***-Moniezia* spp.**	2	3.6	-	-	2	2.0	0.205
3)Nematodes	**38**	**67.9**	**-**	**-**	**38**	**38**	**<0.001****
-Trichuris ovis	5	8.9	-	-	5	5.0	**0.042***
***-Strongyle spp.* eggs**	33	58.9	-	-	33	33.0	**<0.001****
-Strongyloides papillosus	32	57.1	-	-	32	32.0	**.001****

** Statistically significant difference (p<0.01) * statistically significant difference (p<0.05).

4. Morphological characters of helminth eggs detected in sheep feces using a light microscope:

- *Paramphistomum cervi* egg: The detected egg was a large-sized egg, oval in shape, operculated, and morphologically similar to the eggs of *Fasciola hepatica* but are colorless and not bile-stained yellow. Thin-shelled with clear embryonic cells. (Fig.2A)

- *Moniezia spp*. egg: The detected egg was medium-sized. Thick shell, triangular to pyramidal shape, and embryonated with pyriform apparatus that surrounds the hexacanth embryo. (Fig. 2B)

-*Trichuris ovis* egg: The detected egg was barrel-shaped. Thick, lemon-shaped, and brownish shell. With two mucoid plugs and contain one cell stage embryo. (Fig. 2C)

- *Strongyle spp* egg: The detected egg was medium-sized, oval, with barrel-shaped side walls, and thin-shelled with one pole rounded and the other pointed with morula stage (16 - 32 cells), (Fig. 2D)

- *Strongyloides papillosus* egg: The detected egg was a medium-sized egg, oval in shape, Translucent, and thin-shelled with slightly flattened poles with a mature rhabditiform larva (Fig. 2E)

-*Nematodirus spp.* egg*:* The detected egg was a large-sized egg, elliptical, brownish in color, with parallel sides, and a thin shell. (Fig. 2F).

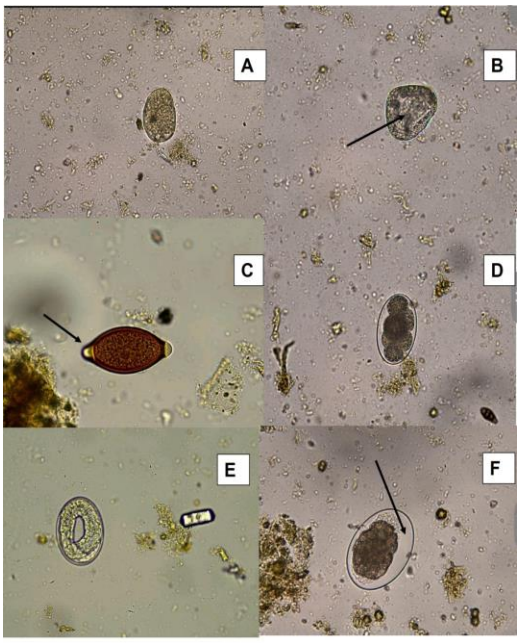

Fig.2: Showing the helminthes found in the feces of sheep x 40. (A): *Paramphistomum cervi*. egg, (B): *Moniezia spp*. egg having hexacanth embryo (arrow), (C):*Trichuris ovis* egg, note the mucoid plug (arrow), (D): *Strongyle spp* egg containing morula stage (E): *Strongyloides papillosus egg* containing larva, (F): *Nematodirus spp*. Note the broad space between the shell and embryo (arrow).

DISCUSSION

The present study revealed that the overall prevalence of helminth parasites in sheep was (47%). Five genera of helminthes were identified, three of them were nematodes (*Strongyle spp.* eggs (33%), *Strongyloides papillosus* (32%) and *Trichuris ovis* (5%), one genus was trematodes (*Paramphistomum cervi* (7%)), and one genus was cestodes, (*Moniezia spp* (2 %)). This result was higher than that recorded by (Elseify *et al.,* 2021) in Sohag, who revealed that the overall prevalence of helminth parasites in sheep was (34.32%), this may be due to differences in hygienic management measurements, climatic conditions and prophylactic control programs in both study areas, but lower than that recorded by (Negasi *et al.,* 2012) in Ethiopia (50.37%), and (Sangma *et al.,* 2013) in Bangladesh (81.1%) which have wormer environmental conditions. Regarding *strongyle spp*., the infection rate was (33%). The obtained result was higher than that recorded by (Elseify *et al.,* 2021) in Sohag (6.5%) and (Sultan *et al.,* 2016) in Kafr El-Sheikh (19.21%). But lower than that recorded by (Minnat, 2014) in Iraq (72.72%), (Sangma *et al.,* 2013) in Bangladesh (62.6%), (Koinari *et al.,* 2013) in Guinea (67.3%), (Kandasamy *et al.,* 2013) in Sri Lanka (78%), and (Martins *et al.,* 2022) in Brazil (77.02%). Regarding *Strongyloides papillosus*, the infection rate was 32%. The obtained result was higher than that recorded by (Elseify *et al.,* 2021) in Sohag (0.6%) and (Al-gaabary *et al.,* 2012) in Gharbia (13.79%), (Sultan *et al.,* 2016) in Kafr El-Sheikh (4.02%), (Ibrahim *et al.,* 2014) in Ethiopia (20.1%), (Sangma *et al.,* 2013) in Bangladesh (9.5%), (Koinari *et al.,* 2013) in Guinea (8.2%), and (Martins *et al.,* 2022) in Brazil (17.48%). But lower than that recorded by (Minnat, 2014) in Iraq (67.37%). Regarding *Trichuris ovis*, the infection rate was 5%. This result was higher than that recorded by (Elseify *et al.,* 2021) in Sohag (0.6%), (Al-gaabary *et al.,* 2012) in Gharbia (0.94%), (Sultan *et al.,* 2016) in Kafr El-Sheikh (2.68%), (Sangma *et al.,* 2013) in Bangladesh (2.1%), and (Koinari *et al.,* 2013) in Guinea (1.8%). But lower than that recorded by (Abo et al., 2007) in Beni-Suef

(7%), (Ibrahim *et al.,* 2014) in Ethiopia (7.9%), and (Gadahi A J *et al.,* 2009) in Pakistan (40 %). Regarding *Paramphistomum cervi,* the infection rate was 7%. The obtained result was higher than that recorded by (Elseify *et al.,* 2021) in Sohag who revealed that (1.2%). But lower than that recorded by (El Hadid *et al.,* 2007) in Beni-Suef (38.88%), (Negasi *et al.,* 2012) in Ethiopia (22.4%), and (Sangma *et al.,* 2013) in Bangladesh (44.2%), nearly equal to (Sultan *et al.,* 2016) in Kafr El-Sheikh (9.38%). Regarding *Moniezia spp*., the infection rate was 2%, which was higher than that recorded by (Sultan *et al.,* 2016) in Kafr El-Sheikh (0.89%) and (Sangma *et al.,* 2013) in Bangladesh who recorded no cestodes were identified. But lower than that recorded by (El Hadid *et al.,* 2007) in Beni-Suef (33.11%), (Elseify *et al.,* 2021) in Sohag (22.49%), (Minnat, 2014) in Iraq (59.89%), (Ibrahim *et al.,* 2014) in Ethiopia (13.1%), (Martins *et al.,* 2022) in Brazil (20.39%), and (Juszczak *et al.,* 2019) in Poland (25%). The susceptible cause of decreased percent of sheep infected by cestodes may be due to less exposure to the intermediate hosts and the presence of natural enemies of the intermediate hosts on the pasture. The differences in the infection rates were also attributed to several factors, such as the breeding system of the studied animals, variations in climatic conditions, sample size, control measures and differences in ecological factors affecting the flourishing of the intermediate hosts and eradication programs in different countries.

In this study, young sheep at age <2 years had a higher prevalence of infection (60.4%) than adult animals at age > 2 years (34.6%). There was a significant relationship between *Strongyle* infection in sheep by age (P<0.05). This result disagrees with that recorded by (Elseify *et al.,* 2021) in Sohag who revealed the highest infection rate in sheep occurs at age 1-3y (51.52%), followed by 0-1y sheep (40%) and the lowest rate of infection was in >3y sheep (6.67%), and (Sangma *et al.,* 2013) in Bangladesh who recorded a significantly higher infection rate in young sheep aged >1-2 years (92.7%) than the adult sheep aged > 2 years (83.3%) and lamb sheep which aged ≤ 1 year (63.6%). This may be due to the well-developed immune response in adult sheep when compared to that in young ones. Another explanation is the changes in the diet nature between young and adult sheep, which may predispose to the helminth infection.

In the current study, the prevalence of helminthes in female sheep was insignificantly higher (47.1%) than males (46.7%). There was no significant relationship between helminth infection in sheep and sex (P>0.05). The obtained result was in accordance with a previous study carried out (Sangma *et al.,* 2013) in Bangladesh who revealed that the prevalence of helminth infection was higher in females (83.3%) than in males (79.3%), but disagreed with that recorded by (Elseify *et al.,* 2021) in Sohag, who recorded a higher infection rate in male sheep (36.59%) than females (33.59%). This may be due to the physiological nature of females, which are subjected to hormonal changes (prolactin and progesterone hormones) during pregnancy and lactation, which can lead to some sort of immunosuppression, and increase susceptibility to infections.

In the current study, the prevalence of helminth infection was highly significant in the cold and temperate season (47%) and negative in hot season (including July and August). Like all other organisms, the parasites are temperature sensitive, and all organisms, including parasites, perform optimally within an evolved temperature range. Hence, a high temperature level could often decrease the parasites' performance and existence, and also elevate the immune response, thereby limiting the infection risk or the intensity of infection. Temperature and dryness are not only affecting the parasites, but also the intermediate hosts and parasites' secondary effects. According to James E Byers (2020), the infection rate of nematodes, trematodes, and cestodes was 67.9%, 12.5%, and 3.6%, respectively, in the cold and temperate seasons and negative in the hot

season. There was a significant relationship between trematode infection concerning the season ($p<0.05$), and there was no significant relationship between cestodes infection concerning the season. There was a significant relationship between nematode infection concerning season ($P<0.01$). these result was in agreement with that proved by (Elseify *et al.,* 2021) in Sohag who revealed that the winter season has the most highly significant infection rate (63.16%), spring (32.50%) then autumn (23.08%), while the summer season has the lowest infection rate (23.07%), (Al-gaabary *et al.,* 2012) in Gharbia who recorded that spring had the highest prevalence (71.59%), autumn (70.31%), winter (68.91%) and summer has the least prevalence rate (43.01%), and (Menshawy *et al.,* 2011) in Beheira who revealed that the highest infection rate was observed in autumn (98.6%) followed by spring (81.2%), winter (73.7%) than summer (55%). A higher prevalence of helminth infection during the cold and temperate season might be due to high humidity, which flourishes the development and growth of the larval stage and intermediate host in pasture, leading to increased contact and possibility of infection of the host by parasites. Whereas in the hot season, dryness led to killing larval stage and intermediate host. Thus, seasonal variations have a direct effect on the prevalence of helminth parasites, as the development of helminthes is surely affected by changes in temperature and humidity. However, the present seasonal variations of helminth infection in Assiut cannot be compared with those in other countries as well as other Egyptian governorates, as they have different climatic conditions, particularly in the amount of rainfall and fluctuating temperatures throughout the different seasons of the year.

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مدى انتشار الديدان الطفيلية فى الأغنام بمحافظة أسيوط ، مصر.

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تعتبر الديدان الطفيلية من أهم الطفيليات التى تسبب خسائر اقتصادية فى الأغنام فى مصر. هدفت هذه الدراسة إلى الكشف عن مدى انتشار هذه الديدان فى الأغنام بمحافظة أسيوط وتم دراسة انتشار الديدان الطفيلية للأغنام من حيث العمر والجنس والاختلاف الموسمي (فصل الشتاء والفصول ذات المناخ المعتدل حيث تتضمن جميع أشهر السنة ما عدا شهري يوليو وأغسطس ولكن فصل الصيف يتضمن شهري يوليو وأغسطس) في محافظة أسيوط ، مصرخلال الفترة من فبراير ٢٠٢٢ إلى يناير ٢٠٢٣ عن طريق فحص البراز. تم فحص عدد ١٠٠ رأس من الأغنام ، منها ٤٧ (٤٧٪) كانت إيجابية. تم تسجيل إصابة مختلطة بنوعين على الأقل من طفيليات الديدان الطفيلية. تم التعرف على خمسة أجناس من الديدان الطفيلية ، منها ثلاثة أجناس كانت نيماتودا وهي الاسترونجيل ٣٣ %، سترونجيلويدس بابيلوسوس ٣٢% و الترايكيورس اوفيس ٥% ؛ جنس واحد كان ديدان التريماتودا ، وهو بارا مفيستومم سيرفاى ٧% ؛ وكان جنس واحد هو ديدان السيستودا وهو المونيزيا ٢ %. كان انتشار الديدان الطفيلية أعلى في صغار الأغنام التي تقل أعمارهم عن سنتين (٦٠,٤٪) مقارنة بالبالغين الذين تزيد أعمارهم عن سنتين (٣٤,٦٪). وكان انتشار الديدان الطفيلية في الإناث أعلى (٤٧,١٪) منه عند الذكور (٤٦,٧٪). فيما يتعلق بالاختلاف الموسمي ، كان انتشار الديدان الطفيلية مرتفعًا بشكل ملحوظ في فصل الشتاء والفصول ذات المناخ المعتدل (جميع أشهر السنة ما عدا يوليو وأغسطس) (٤٧٪) مقارنة بفصل الصيف (شهر يوليو وأغسطس) (٠٪).