The First Record of Nematodes in Ostriches (*Struthio Camelus* Linnaeus, 1758) of Uzbekistan

SOHIBA IBRAGIMOVA[1,2*], LOLA GANDJAEVA[1,2], IKRAM ABDULLAEV[1,2], MOXIRAXON BEKCHANOVA[2]
[1]Khorezm Mamun Academy,
Markaz Str., 1. Khiva, 220900, Khorezm region,
UZBEKISTAN

[2]Urgench State University,
Hamid Olimjon Str.,14, Urgench, 220100, Khorezm region,
UZBEKISTAN

[*]*Corresponding Author*

Abstract: - Breeding of ostriches is a recently developed sector of venter production in the Khorezm region of Uzbekistan and it is still a young poultry industry. Ostriches have acclimatized approximately since 2015 in Uzbekistan. From this time and until recently, so little exploration has been performed on ostriches and any parasitic species of ostriches have not been researched in Uzbekistan. The objective of the exploration is to define the first findings of two species of nematodes in ostriches (*Struthio Camelus*) introduced in the Kushkupir district, the Khorezm region of Uzbekistan. The main target of the exploration was to identify the first findings of some nematodes found in ostriches on the farm called "Ibrat-Ruzmat" located in the Kushkupir district, the Khorezm region, Uzbekistan. We recognized the incidence of nematodes in farmed ostriches during the time of conserving and growing ostriches. A total of 15 ostriches from which 15 ostriches (7 were males and 8 females) were over 3 years old with an average weight of 120 kg in the farm named "Ibrat -Ruzmat" were selected for the research from September 2021 to February 2022. Fecal samples gathered from the farm were sent to a laboratory named "Preventing the Spread of Termites and Fighting against them" in Khorezm Mamun Academy, Khiva, Uzbekistan. The parasites determined for the first time in farmed ostriches were nematodes including *Libyostrongylus douglassii and Libyostrongylus dentatus.* Our findings demonstrate a high prevalence of *Libyostrongylus spp.* in ostriches on a farm located in the Kushkupir district, the Khorezm region, Uzbekistan. Studying ostriches' nematodes and further developing measures against them is important.

Key-Words: - Helminths, nematode, ostrich, imported, *Libyostrongylus douglassii, Libyostrongylus dentatus*

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1 Introduction

The ostriches (*Struthio camelus* Linnaeus, 1758) are the strongest birds pertaining to the ratites, [1], [2]. Ostriches came from Africa and the profit-oriented raising of ostriches has attained economic significance, over the world because of the ability of these birds to accommodate various climates and their lucrative agricultural potential, [2], [3]. Ostrich (*Struthio camelus*) farming was commenced as a money-oriented work for the manufacture of feathers, [4], [5], in the 19th century. At the beginning of the 20th century, there have been more international concerns about raising ostriches considered a multi-processing business for the outputs of high-quality feathers, leather, and meat, [1], [4]. Ostrich farms considered one of the most preponderant agricultural projections giving a steady income has become widespread throughout the universe, [1], [5]. Over time, domestic production of ostriches is rooted in many countries including Argentina, Australia, the USA, Egypt, [5], Brazil, [2], [6], Croatia, [7], the United States, [3], Spain, [4].

Currently, the prospect of ostrich farming outside Africa is inaccurate because of several circumstances embodying a scant market and erroneous revenue prophecy, [4], and atmospheric conditions which are a limitation for commercially successful farming, [1]. One of the usual issues in the breeding of ostriches in captivity is the management of parasitic ailments, notably

engendered by parasites as an influence on production, morbidity, and mortality, [2], [3]. Despite the increasing interest in ostrich farming, little is known about ostrich parasites, [4]. Multiple species can parasitize ostriches, including nematodes, cestodes, trematodes, protozoa, and others, [2], [6], [8]. Nematodes are considered the main limitations of the growth of ostriches, [2]. Although veterinary controls are available in importing countries, [4], poor management and a lack of sanitation are the factors that contribute to parasite infection, [8].

Libyostrongylus sp. was probably input into Uzbekistan when farmed ostriches were brought from abroad (chiefly Africa) in about 2015. Based on the money-making callings of farmers and businessmen in breeding ostriches, now Uzbek farmers have farmed ostriches to gain more high-quality products since about 2015 years. Basic and the most essential step before performing convenient surveillance measures is to be informed what parasites can be detected in ostriches. Commonly, parasites are investigated poorly in these birds in countries that are sourcing them from abroad, [4]. The best strategy for escaping forthcoming economic prejudice and infection is to foreclose the entry of the parasites into the swarm, [16].

Nematodes of the genus *Libyostrongylus* Lane, 1923, encompasses *Libyostrongylus douglassii* Lane, 1923, *Libyostrongylus dentatus* Hobert, Lloyd & Omar, 1995, *Libyostrongylus magnus* Gilbert 1937, [2], [12], [14], [16], [18], and each of which can cause infection in the proventriculus of ostriches, [16]. *Libyostrongylus douglassii* is situated under the koilin layer, when it comes to *Libyostrongylus dentatus,* it can be detected within the koilin layer, [16]. Beforehand, these two species had been informed to be situated under the koilin layer, [16]. *Libyostrongylus douglassii* was mentioned in Brazil, [12], [14], [16], [18], Netherlands, Belgium, France, Spain, [4], Greece, [19], South Africa, [20], and it was reported by [16], that this species was not determined in Asian and Antarctica until 2015. In 2020, [5], explored ostriches brought by Baron Friedrich Edward Falz-Fein as an experiment in Ukraine and rooted in the Askania-Nova estate. *Libyostrongylus dentatus* was recorded in North America, [3], Brazil, [12], [14], [16], [18]. Based on the data given by Nicole Brand Ederli, *Libyostrongylus magnus* has been identified solely in South Africa, [2].

The basic goal of the research was to describe the first findings of some nematodes detected in ostriches imported on the farm called "Ibrat-Ruzmat" located in the Kushkupir district, Khorezm region, Uzbekistan during 2021–2022.

2 Materials and Methods

2.1 Study Area

The exploration was investigated from September 2021 to February 2022 on the "Ibrat-Ruzmat" farm situated in the Kushkupir district, Khorezm region. Khorezm region is one of the northern regions of Uzbekistan, [21]. The Khorezm is one of the oases of the great historic civilizations of Central Asia, fed by the ancient river Oxus, today the Amu Darya River, [22]. The earth's field is 6.1 thousand square km and acquires 1.4% of the space of Uzbekistan (Fig.1.).

Fig.1: Geographic localization of the Kushkupir district in the Khorezm region.

According to the geographical location of the province, it is located between 40 ^{0}-31^0 and 42 ^{0} north latitudes and 60 ^{0}-62 ^{0} east longitudes. Its territory is 280 km from northwest to southeast, and 80 km from west to east in the width of the city of Urgench. The climate is sharply continental with very cold winters (up to -41^{0}C), hot (+25 and +30^0), and very hot summers (up to +45^{0}C). The average annual temperature of the oasis is +13.9^{0}C, and +15^{0}C in the southern part of the oasis. Due to its location in the desert zone, the climate is dry, [21].

2.2 Study Animals

This investigation was conducted on 15 farmed ostriches inhabiting a small private ostrich farm situated in the Khorezm region, the name of the farm is "Ibrat -Ruzmat" in the Kushkupir district. 1 hectare of the sandy place in the Kushkupir district has been allocated where conditions similar to African savannas have been created on this farm. The length of the field where ostriches walk and are surrounded by a wooden fence is about 70-100

meters and the width is about 20-25 meters. In total, 15 ostriches were examined for the existence of nematodes with the help of fresh fecal specimens taken in the early hours of the day.

2.3 Collection of Fecal Samples of Ostriches on the Farm

Fresh fecal specimens were agglomerated from every ostrich in the forenoon making use of plastic vials and docketed with farms, a date of conglomeration, the time, etc. from each ostrich. Several fecal specimens' details of farmed ostriches in the farm located in the Kushkupir district, in the Khorezm region of Uzbekistan. All samples were gathered from the ground after birds defecated, [6] by utilizing a new sterile polystyrene spatula for every bird species to stay away from fecal contamination with soil, [4], [10], because fecal samples can be made impure with larvae of free-living nematodes when the feces fall to the ground, [8], [11], or intestinal contents with other host fluids, [4]. They were transported to the laboratory within 2 hours, samples were stored at the temperature of 3-4^{0}C, [11], or 10 ^{0} C, [4], until received at the laboratory of Khorezm Mamun Academy. All collected samples were examined within 48 hours and fecal cultivation was done as described by [6], [4].

2.4 Methods of Identification of Helminths, Their Ova, and Larvae in the Feces when the Animal is Alive

Investigations were performed using helminthocaprological examinations.

Helminthocaprological examinations are divided into the following groups:

-helminthoscopic (finding helminths or their fragments)

-helminthoovoscopic (in Latin, this means ovum-egg- finding eggs of helminths)

-helmintholarvoscopic (in Latin, this means a larva, finding larva of helminths) examinations.

-Method of helminthoscopic diagnosis. Helminthoscopy is used to find sexually mature and young helminths or their fragments. Helminths can be found in fecal samples (some trematodes, cestodes, and nematodes). Fresh fecal samples are examined to see the knuckles of mature cestodes of ruminants, carnivores and birds.

-Methods of helminthoovoscopic diagnosis. Helminthoovoscopy unifies several inspection methods that are used to find helminth eggs.

Fecal specimens are taken in the amounts of 4-10 grams from the rectum or ground. Rubber gloves are worn when fecal samples are taken from the rectum. Fecal samples are gathered from the ground by avoiding fecal contamination with soil, [4], [10], because fecal samples can be contaminated with larvae of free-living nematodes when the feces fall to the ground. Due to the not hatching of larvae of fasciolosis, ascariasis, and other parasites, it is allowed to take fecal samples from the ground for an examination of these diseases. If it is not possible to check samples taken on time, in that case, specimens are preserved at a temperature of 3-4 ^{0} C in a refrigerator, [11]. The direct smear, [11], floatation, [11], and sedimentations methods, [23], were utilized.

-Helmintholarvoscopic methods of diagnosis.

Helmintholarvoscopy, a set of methods and examinations of fecal samples, tissues, and organs, is used to find larvae and pathogens. The essence of this method is that because of thermotaxis, nematodes get out of the tissue or fecal samples in warm water (36-37 degrees Celsius) and sink to the bottom of the dish, [11].

Fecal cultivation to find infective larvae of nematodes were performed as described by [6].

2.5 Statistical Inspection

All outcomes were counted from the determined information, and the overall percentage prevalence of the figure of specimens that were infected, and the parasites encountered in each farm were determined.

2.6 Prevalence

Prevalence for a given parasite species is the number of hosts infected with 1 or more individuals of a particular parasite species (or taxonomic group) divided by the number of hosts examined for that parasite species, [5], [9], [13].

$$P = x/y * 100$$

where:

P- prevalence

x – the number of animals that have identified eggs or larvae of helminths

y- total number of animals examined

100- percentage conversion factor.

3 Results and Discussion

Throughout the time of the investigation, 15 specimens of feces from ostriches were surveyed from September 2021 to February 2022 to define the existence of nematodes in ostriches in the farm of "Ibrat-Ruzmat" and the overall infection degrees with *Libyostrongylus douglassii* and

Libyostrongylus dentatus were 80 % and 53,3 % respectively. Through studies, eggs *of Libyostrongylus spp.* were recorded on the farm. The eggs showed the common characteristics of *Strongylida*. According to the analysis, the fecal cultures confirmed the presence of infective larvae of *Libyostrongylus douglassii* and *Libyostrongylus dentatus* which cause infection in ostrich groups in Kushkupir district, Khorezm region, Uzbekistan. Based on the findings, we observed that the prevalence of *Libyostrongylus douglassii* (80%) was greater than the *Libyostrongylus dentatus* (53,3 %) on the farm (Table 1).

Table 1. Findings of fecal samples collected from the farm in the Kushkupir district, Khorezm region, Uzbekistan

Found nematodes		**Farm examined**			
Nematodes		**"Ibrat-Ruzmat" farm**			
		No.of examined birds	**No. of positive birds**	**Samples**	**%**
1	*Libyostrongylus douglassii*	15	12	Faeca	80%
2	*Libyostrongylus dentatus*	15	8	Faeca	53,3%

The trouble of parasitic ailments of indigenous and agricultural animals stays relevant, [5], although the entrance of new anthelminths, [15] and cleansing agents, [5].

Ostriches have several parasites, the majority of which can be found in the gastrointestinal tract, [4]. According to the data of [4], more than one parasite species (mostly, Protozoa) can be found in all imported animals and born birds. Some parasites are specific for ratites, while other parasitic species can be found in ratites and other animals, [1], [4]. In scientific literature, endoparasites including protozoa and helminths of ostriches were researched in different countries, except Uzbekistan.

Parasitological investigations are crucial for the preservation of venters because they confer to get measure the jeopardy of conveyance of pathogens to ostriches raised in farms in captivity from imported barbarous populations and inversely, [5].

Contagions with two types of nematodes in ostriches are 80% for *Libyostrongylus douglassii* and 53,3% for *Libyostrongylus dentatus* in "Ibrat-Ruzmat" farm, in Kushkupir district, Khorezm region, Uzbekistan. The results gained in the farm in Kushkupir district are disparate from those of extraneous investigators. According to the preliminary explorations, for example, 38,1 % in the Dnepr region, 40 % in the Donetsk region, and 71,4 % of ostriches in 2020 in the Kharkov region, Ukraine, [5] were infected with *Libyostrongylus douglassii* nematode. Based on our outcomes, the invasiveness of *Libyostrongylus douglassii* nematode in ostriches was 80%. It means that further investigation is needed more exploration when it comes to the fauna of parasites of ostriches in the Khorezm region, Uzbekistan.

The *Libyostrongylus* ("wireworm"), an ostrich-specific *trichostrongylidae* nematode, [6], was described as a cause of persistent infection creating a sickness named "vrootmag" or "rotten stomach" causing 50% high mortality for ostriches, [6], [7] and their nestling, [6] and typically also to adults, [4].

Its parasitism can cause anemia, weight loss, anorexia, and proventriculitis, [6], [7]. In ostriches, three species of *Libyostrongylus* can be found: *Libyostrongylus douglassii*, *Libyostrongylus magnus*, and *Libyostrongylus dentatus*, [2], [4], [16]. Based on the records of current literature, *Libyostrongylus douglassii* from Ukraine, [5], Brazil, [14], [16], Croatia, [17], and *Libyostrongylus dentatus* Brazil, [14], [16], and North America, [3], have been detected in ostriches. Infestation is constant in several states over the world, where ostriches are bred, [5].

The existence of nematodes we determined in ostriches is vindicated by other scholars ([4], [5], [16], [3], [7], [14]). Most overseas explorations are conferred to the research of nematodes from the genus *Libyostrongylus* sp., protozoa, and in our situation, we need to investigate endoparasites that can be found in ostriches and have not been explored enough in Uzbekistan. The emergence of infestation with nematodes amidst mature ostriches accomplishes that the pathogen stayed in the ostriches' bodies, which have already been sourced from abroad to Uzbekistan. This signifies that quarantine measures need to be accomplished in farms when ostriches are brought from out of the country. More heed needs to be focused on the sanitary and veterinary measures which are compulsory in the raising of poultry, [5].

4 Conclusion

Poorly is known about ostriches that have been imported recently to Uzbekistan. Helminths infestation in ostriches farmed in Uzbekistan have not been recorded until now and outcomes of the forenamed exploration reported total infection levels of investigated ostriches on the private farm with *Libyostrongylus douglassii* and *Libyostrongylus dentatus* were 80% and 53,3 % respectively. To our science, this is the first record of nematodes- *Libyostrongylus douglassii* and *Libyostrongylus dentatus* found in imported ostriches in the Kushkupir district, Khorezm region of Uzbekistan. We have researched overall 15 ostriches, from which 15 ostriches (7 were males and 8 females) were over 3 years old with an average weight of 120 kg on the private farm situated in Kushkupir district, were chosen for the investigation. The study features infestations with *Libyostrongylus douglassii* and *Libyostrongylus dentatus* on the farm. But there were many drawbacks of this research, firstly it took some time to check the samples in the laboratory where all reagents and types of equipment were not satis. Right now, we only can find the species composition of helminths of ostriches, and other laboratory work at the molecular level cannot be done by us due to the lack of laboratory equipment and reagents. Besides, there are several farms in the Kushkupir district, Khorezm region where we have not finished investigating ostriches in all farms, only we examined one private farm. We think that further studies are needed again to determine the full species composition of helminths of ostriches on the farm we researched and on other farms too.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

-Sohiba Ibragimova conducted a research and investigation process, especially performing the experiments, and provision of study materials, reagents, materials, and laboratory samples taken from ostriches.
-Lola Gandjaeva assisted to identify species and the preparation of the article, specifically writing the primary draft.
-Ikram Abdullaev took responsibility for the planning and execution of the exploration activity on the farm.
-Moxiraxon Bekchanova closely assisted in shaping the format of the article.

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