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Diagnostic study of external parasites and some intestinal protozoa in *Struthio camelus* In Al-Diwaniyah Province

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Abstract

The ostrich (*struthio camelus*) is a bird known for its strength and adaptability; however, it is susceptible to various parasitic, bacterial, and viral diseases, which in turn affects ostrich farming and consequently reduces the production of meat, feathers, and hides. This study provides important data about the presence certain species of parasites affecting ostrich.Sixty fecal samples were collected from ostriches in the Diwaniyah Province center and some of its districts and sub-districts to investigate intestinal protozoa.Temporary and permanent slides were prepared, and external parasites were investigated with the naked eye and using a magnifying glass.five species of parasites recorded , including three species of intestinal protozoa *Cryptosporidium* spp. , *Isospora* spp., and *Eimeria* spp., and two species of lice *Menacantus stramineus* and *Menopon gallinae* ,The overall infection rate was (53.33%), *Cryptosporidium* spp. recorded the highest infection rate among the isolated parasites at (34.37%), followed by *Eimeria* spp. at (15.62%), then *Isospora* spp. at (9.37%) .As for external parasites, *Menacantus stramineus* was the most prevalent, with an infection rate of (21.87%) ,followed by *Menopon gallinae* at (18.75%) .

Keywords: *Struthio Camelus*; External; Intestinal Parasites; Iraq.

1. Introduction

Ostrich meat is considered an alternative to red meat, as it is characterized by its low fat and cholesterol content and high protein content, the ostrich is described as a large, flightless bird. Its body is covered with long feathers, the color of which varies according to sex. Males have black feathers, a short white tail, and a bare neck, while females have brown feathers. Its feed on plants, insects, and grains [1]. Ostrich farming is currently a growing industry and considered one of the most profitable agricultural projects. Ostriches live in open grasslands and are found throughout Asia, South and East Africa, Somalia, and the Arabian Peninsula. However, due to hunting, ostriches can be found in captivity all over the world [2].

External and internal parasites are among the major problems threatening the health of rare species [3, 4]. Many scientific sources indicate that some animals in public parks are infected with parasites capable of infecting humans, which in turn poses a risk to public health [5, 6].One of the reasons for the spread of parasitic diseases is the confinement of animals, which leads to changes in their living conditions [7-10]. The constant stress resulting from captivity weakens the animals' immune systems, thus making them more susceptible to parasitic infections [7, 11].In Iraq, studies on this subject is still very few, which led us to carry out this research to survey the external and intestinal parasites associated with Ostrich in the Agricultural Center in Al-Diwaniyah province.

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2. Materials and methods

2.1. Samples collection

60 fecal samples were collected from ostriches, some located in the city center and some in the districts and sub-districts of Al-Diwaniyah province, and were placed in clean, refrigerated plastic boxes to preserve the samples. To detect intestinal protozoa, two glass slides were prepared for each sample to investigate trophozoite or cysts stages in the fecal samples. One slide was stained with modified Ziehl-Neelsen stain to diagnose *Cryptosporidium* spp., and the second slide was stained with Lugol's iodine stain to diagnose the remaining parasites. All glass slides were examined under a light microscope at magnification of (40X) or (100X).Identification of intestinal protozoa were based on morphology as well as micrometric measurements as provided by Bowman *et al*.,[12] .

As for external parasites, different areas of the ostrich's body were examined with the naked eye and with the help of a magnifying glass and with blunt, pointed forceps to avoid any harm to the host and the parasite,. The isolated samples were preserved in ethyl alcohol %70 with some drops of glycerin, and the louse specimens were identified, based on the classifications described by Tylor & Muller [13].

2.2. Statistical analysis

The data obtained were analyzed by use the chi-square test under probability level of $p \leq 0.05$, in order to study the correlation between the infections with the prevalence of the parasites.

3. Results

The results of the current study showed that ostriches are infected with five species of parasites, including three species of intestinal protozoa *Cryptosporidium* spp. , *Isospora* spp., and *Eimeria* spp., and two species of lice *Menacantus stramineus* and *Menopon gallinae* as shown in Figure 1 ,The overall infection rate was (53.33%), based on 32 samples. *Cryptosporidium* spp. recorded the highest infection rate among the isolated parasites at (34.37%) (11 samples), followed by *Eimeria* spp. at (15.62%), and (5 samples) then *Isospora spp*. at (9.37%) (5 samples).As for external parasites, *Menacantus stramineus* was the most prevalent, with an infection rate of (21.87%) (7 samples), followed by *Menopon gallinae* at (18.75%) (6 samples). Statistical analysis did not reveal any significant differences in infection rates at the probability level $p \leq 0.05$.

Table 1 Species of parasites isolated and infection rates in ostriches in Al-Diwaniyah province

Species of parasite	Number of birds examined	Number of infected birds	(%) Percentage of infection
Cryptosporidium spp.	60	11	34.37
Eimeria spp.		5	15.62
Isospora spp.		3	9.37
Menacantus stramineus		7	21.87
Menopon gallinae		6	18.75
Total		32	53.33

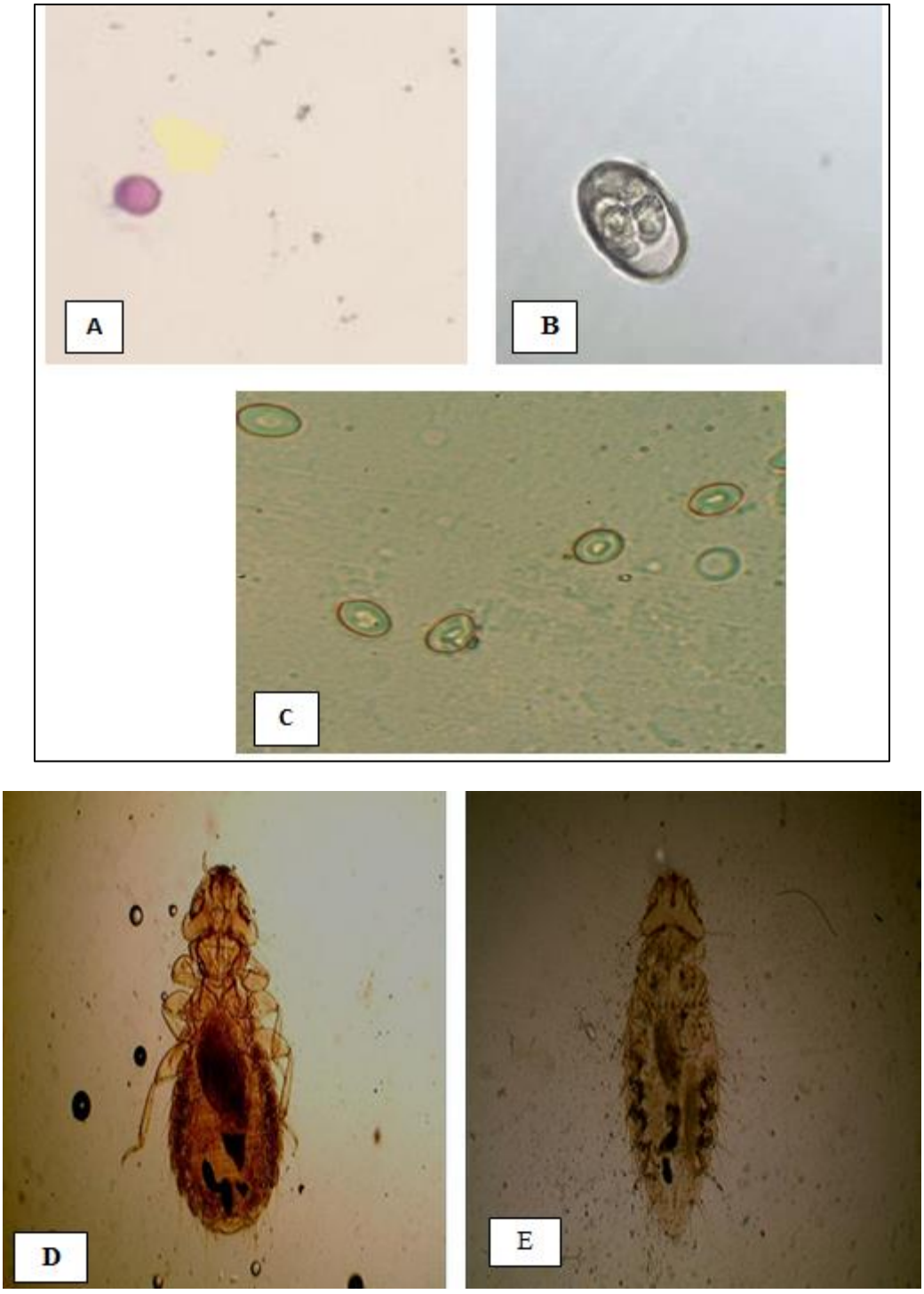

Figure 1 Species of internal and external parasites isolated from the ostrich are shown, A:*Cryptosporidium* spp.,B: *Eimeria* spp., C: *Isospora* spp.,D: *Menacantus stramineus*, E:*Menopon gallinae*

4. Discussion

Birds of all kinds are essential hosts for parasites, whether internal or external, because they are found in diverse environments and act as reservoirs for many parasites [14], Ostriches are particularly susceptible to protozoan parasites, including *Entamoeba struthionis* ,The prevalence of these parasites depends on many factors, such as the host's immune system, environmental conditions, and habitat characteristics [15,16].

This study recorded three species of intestinal protozoa *Cryptosporidium* spp. , *Isospora* spp., and *Eimeria* spp., and two species of lice *Menacantus stramineus* and *Menopon gallinae*, with an overall infection rate of 53.33%, This percentage is higher than the 36% recorded by [17], who observed the infection of ostriches in Iraq., this may be due to differences in the number of specimens selected area of the study, The results indicate that there are no significant differences in the percentage of the infected animals with intestinal parasites.

The parasite *Cryptosporidium* spp. recorded the highest percentage among intestinal parasites, reaching 34.37%, this is consistent with [1] study, which confirmed the infection of ostriches in Babylon Province .*Cryptosporidium* spp. common parasite that is not limited to birds has been recorded in reptiles, fish, amphibians, and humans [18,19]. Infection of this parasite occurs by ingestion oocysts containing spores with contaminated water and food. The chances of infection with this parasite increase with the presence of animals in large numbers inside rearing cages.

Eimeria spp. is an intracellular parasite that infects poultry, ornamental birds, and wild birds. In this study, it was recorded in five samples at a rate of 15.62%. [20] described the life cycle of this parasite directly. Infection occurs through the ingestion of oocysts present in water or food, upon entering the animal's body, the trophozoite is released, beginning an asexual cycle followed by a sexual cycle that leads to the formation of thousands of oocysts, which are excreted in the feces and can infect another animal.

Isospora spp. parasite was isolated from only three samples, representing 9.37%.This percentage differs from other studies, possibly due to variations in study locations, the number of animals examined, and sample preparation methods. One such study, by [21] in Rio Grande do Sul, Brazil, found oocysts of the *Isospora* sp. in an African ostrich farm, though the infection rate was not specified. This percentage is lower than the 15% reported by [22] for imported European ostriches.

As for lice, two species, *Menacantus stramineus* and *Menopon gallinae*, were isolated during this study, with an infestation rate of 21% and 18% respectively. The registration of these species is considered a new host for them, as studies did not indicate their registration previously in ostriches. However, these species are registered in different hosts, including chickens, peacocks, and other birds. The reason for the high infestation rate of *Menacantus stramineus* and *Menopon gallinae* may be due to its high reproductive efficiency [1]. The presence of these two species of lice in ostriches indicates an infestation originating from poultry or birds that have mixed with the ostriches on the same farm.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed

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