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Evaluation of the Effects of *Artemisia herba-alba* on Intestinal Parasite Infections in Domestic Pigeons (*Columba livia*) in Albeida City, Libya

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الملخص:

الهدف الأول من هذه الدراسة هو معرفة أنواع الطفيليات المعوية الموجودة في الحمام المنزلي في مدينة البيضاء في ليبيا. وأجريت الدراسة على عدد100 طائر من الحمام المنزلي جمعت من السوق الشعبي في المدينة وفحصت عينات البراز بطريقة الفحص المباشر للعينة بالعين المجردة بالإضافة إلى طريقة الفحص بإجراء مسحة مباشرة من البراز وفحصها تحت المجهر بالإضافة إلى طريقة الفحص بالتعويم وكانت نسبة الإصابة المختلطة حوالي 60% بينما طفيل الكوكسيديا حوالي 40%. والهدف الثاني من الدراسة كان معرفة تأثير المستخلص المائي لنبات الشيح على الطفيليات المعوية في الحمام المنزلي واختبرت عدد 40 حمامة مصابة بعدوى مختلطة من طفيل الكوكسيديا وطفيل الكابلري وقسم الحمام الى 4 مجموعات،10 حمامات في كل مجموعة واستخدم تركيز 5%, 10%, 15% 20% من المستخلص المائي لنبات الشيح وجرعت المجموعات عن طريق الفم جرعة واحدة في اليوم لمدة 3 أيام. بعد ذلك أُعيد فحص البراز لكل المجموعات مرة أخرى. وأظهرت النتائج عدم وجود فروقات معنوية في عدد بيوض الطفيليات في الحمام المعالج مقارنة بعدد البيوض قبل العلاج مما يؤكد أن فاعلية نبات الشيح مضاداً للطفيليات تحتاج إلى المزيد من الابحاث.

الكلمات المفتاحية:

مضادات الطفيليات، المستخلص المائي، طفيليات الأمعاء، الحمام، Artemisia herba-alba

Abstract:

The first aim of the current study is to investigate the presence of intestinal parasitic infections in domestic pigeons (*Columba livia***)** in Albeida City, Libya.

individually faces samples from 100 birds were collected and examined using direct smearing and the flotation method. The majority of the pigeons (60%) were likely to have mixed infections with one or two of intestinal parasites (*Eimeria* 40%, *Capillaria* 50%, *Heterakis* 8% and *Raillietina* 2%). The second goal is to determine the anti-parasites effects of *Artemisia herba-alba* aqueous extract on intestinal parasite infection. The birds were divided into 5 groups of ten each for different concentration of *Artemisia herba-alba extracts* (5 %, 10 %, 15 % 20 % and control group) administered orally once a day for 3 days. The results showed that there was no significant reduction in the numbers of internal parasites (*Eimeria* oocysts and helminths eggs) in infected pigeons.

Keywords: *artemisia herba-alba*; anti-parasites; aqueous extract; intestinal parasites; pigeons

1. INTRODUCTION

Domestic pigeons are bred for hobby and source of food in some countries including Libya[1]. They are regarded as a major public health concern for humans and other animal species, including poultry in the wild [2,3,4]. Domestic pigeons do not migrate, but they are capable of carrying a variety of parasites that are transmissible to humans [5]. These birds can be parasitized by a wide variety of ecto and endoparasites, including nematodes, trematodes, cestodes, and acanthocephalans [6,7]. Coccidiosis is a highly infectious protozoa disease that causes a common illness by infecting the intestines of birds and other animals.

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It is caused by the genus *Eimeria*, a complex and diverse group of protozoan parasites[8, 9]. Only three species (*Eimeria columbae*, *Eimeria columbarum*, and *Eimeria labbeana*) are considered pathogenic in domestic and rock pigeons, despite the fact that there are a total of *Eimeria* spp. in the world [10,11]. Although adult pigeons can carry the parasite without showing any symptoms, young aviandis suffer from severe infections that include gut damage, caecal injury, and bloody diarrhea [12]. Capillariasis or capillariosis, on the other hand, is a disease caused by *Capillaria* worms in poultry. *Capillaria* species can cause significant growth depression and egg production losses as well as high mortality rate [13].

Artemisia is an important medicinal plant used in folk medicine by many cultures. The plant is a member of the Asteraceae family, which contains over 300 species worldwide, including *Artemisia herba-alba*. The World Health Organization (2010) recommends artemisinin (the main active compound of *Artemisia*) as a first choice for simple antimalarial drugs. Several studies have also found that the

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compound has antibacterial and antioxidant properties [14,15] . Recently, several *Artemisia* spp. have been reported to have new medicinal effects due to the anti-parasitic effects of Artemisinin-based compounds. A recent study found that ethanolic extracts of Artemisia annua (600–1000 mg/kg) and Artemisinin (200 mg/kg) given to gerbils for five days were safe but unable to control the nematode *Haemonchus contortus* [16]. The same ethanolic extracts, however, were effective in killing *Schistosoma japonicum* and *Fasciola hepatica* in vitro at 0.2 g/mL and 20 g/ml [17]. Furthermore, *Artemisia herba-alba* could be used as an alternative to standard antihelmintic drugs to control the infection of turkey poults with *H. gallinaruma* [18]. Several studies have increased the anticoccidian activity of *Artemisia* plant extracts in chickens. It has been demonstrated that the anticoccidial activity of Artemisia plant extracts is determined by the number of oocysts and the type of *Eimeria*, rather than the broiler breed [19]. As a result, the current study sought to evaluate the efficacy of treatment with *Artemisia herba-alba* aqueous extract on domestic pigeons naturally infected with gastrointestinal parasites in Albeida city, Libya

2. MATERIALS AND METHODS

2.1. Preparation of the *Artemisia herba-alba* aqueous extract

The plant material for the present study was collected from the areas around the city of Albayda. 100 g of dried *Artemisia herba-alba* leaves were soaked in 500 ml distilled water and the mixture was shacked overnight making an aqueous extract concentration of 20%. The extract was filtered twice and stored at 4°C before being used.

2.2. Experimental 1

100 adult pigeons were collected from regions of the city and they were kept in cages with adequate food and water where provided carefully. Fresh faecal samples were collected into a dry vial from the cloaca by gently squeezing the abdomen. The samples were initially examined by the naked eye for the presence of proglottid cestodes, and then direct smear examination and the floatation method were used for detecting helmin in the eggs and coccidian oocysts and were observed under a light microscope at 10X and 40X [20]. According to Dranzoa et al [21], the following numerical scores were used to represent the levels of parasite infection on birds:

No parasites observed (0); Low infection: fewer than ten parasites observed (1); Medium infection: ten to twenty parasites observed (2); High infection: more than twenty parasites observed (3).

2.3. Experimental 2

The purpose of this study was to determine the anti-parasite effect of *Artemisia herba-alba* aqueous extracts on infected pigeons. Pigeons infected with both *Capillaria* spp. and *Eimeria* spp. (40 birds). They were split into four groups: A, B, C, and D. There were ten pigeons (n=10) in each group, with no significant size differences between the birds. The means of oocyst count before the treatment were used as control. The pigeons were given the aqueous herbal extract via oral administration once a day for three days at concentrations of 5%, 10%, 15%, and 20%, respectively. Fresh faecal samples were collected and analyzed three days after the treatment to assess the effect of plant aqueous extracts on the infection.

For the statistical analysis, SPSS software version 17 was used. Using a Paired t-test, the mean value for each group was calculated and compared before and after treatment. P-values of less than 0.05 were deemed statistically significant.

3. RESULTS

3.1. The types of gastro-intestinal parasites and the rate of infection

All 100 birds harbored many forms of gastro-intestinal parasites (*Raillietina*, *Heterakis*, *Capillaria*, and *Eimeria*) (Fig. 1). Overall, the prevalence rate of infection in the present study was 40% for *Eimeria* spp., and 60% for multiple infections (Table1).

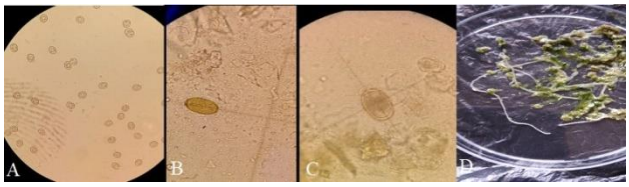


Figure 1. The gastro-intestinal parasites; A: *Eimeria*oocyst, B: *Capillaria* spp., C: *Heterakis*, D: *Raillietina* of domestic pigeons in Albaida city, Libya (40 X)

Table 1. The prevalence of intestinal-parasitic infections in different groups of domestic pigeons

Type of Parasite	infected birds	Percentage (%)
Eimeria spp.	40	40%
Capillaria spp. and *Eimeria* spp.	50	50%
Heterakis spp. and *Eimeria* spp.	8	8%
Raillietina spp. and *Eimeria* spp.	2	2%
Mixed infections	60	60%

3.2. The anti-parasitic activity of *Artemisia herba-alba* extracts

Examination of fecal samples from all pigeon groups for *Capillaria* spp. and *Eimeria* spp. oocyst count per 40 microscopically fields after oral administration of 5%, 10%, 15%, and 20% aqueous extracts of *Artemisia herba-alba* one time a day for 3 days revealed no significant differences in the means of oocyst count in the different groups before the treatment (control) (Figs. 2 and 3).

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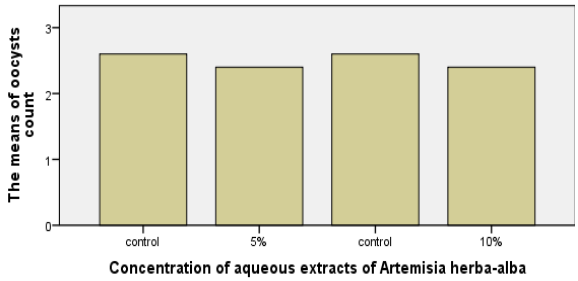


Figure 2. The antiparasitic effect of *Artemisia herba-alba* extracts (5 and 10%) on infected pigeons; Control: The means of oocyst count before the treatment

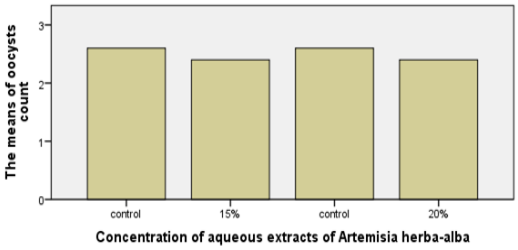


Figure 3. The antiparasitic effect of *Artemisia herba-alba* extracts (15and 20%) on infected pigeons; Control: The means of oocyst count before the treatment

4. DISCUSSIONS

4.1. The types of gastro-intestinal parasites and infection rate of domestic pigeons in Albeida City, Libya

In the present study, the global infection prevalence was 100%, that is every bird was positive for at least one parasite. High parasitic infection in the present study is often due to the constant source of infested droppings or infested intermediate hosts like pill bugs, ants, beetles, earthworms, and snails in the current location of the pigeons [22]. In our results, *Cestodes* showed a low prevalence of 2%, which could be due to the lower number of intermediate hosts [7]. On the other hand, all the birds examined in this study were adults, and this may also have conferred a certain level of host immunological response against the establishment of the *Cestode*. This result was lower compared with the other studies which recorded 50% [23] and 63% [24].

Nematodes constitutes an important group of poultry helminthes, in terms of species and pathology. Species of the genera *Hetarakis, Ascardia, Capillaria*, and *Syngamous* are generally the most important nematodes [22]. The prevalence of *Heterakis gallinarum* in this study was 8%, which may be because the infective stages of nematodes in the wet season are hidden below soil surface [22]. Recently, a study reported that the harsh climatic conditions may be responsible for the low population of invertebrate hosts and might have negatively affected the viability of oncospheres of some *cestodes* and the hatching of some *nematode* eggs, resulting in the low infection rate of this parasitic organism [25].

A qualitative examination of 100 pigeons in this study revealed 50 samples (50%) with *Capillaria* infection. Numerous studies suggested that quantitative examination for *Capillaria* infection was high during the monsoon season. The lower rate of infection was in very cold and very hot months [26, 27]. This high prevalence (50%) of *Capillaria* spp. infection in domestic pigeons corresponded with studies of Qamar et al [27] and Basit et al [28].

Coccidia are common pathogenic parasites in pigeons referred to as coccidian [29].

In the present study, the prevalence of *Coccidia* spp. infection at 100% may be due to the availability of moisture at the time of the study. Coccidiosis usually runs without clear clinical manifestations of acute gastroenteritis [30]. Reddy et al [31] has detected that Coccidiosis affected pigeons that looked healthy but presented with lethargy and occasional watery diarrhea. Some researchers observed that susceptible and weakend birds ingested large numbers of mature and sporulated oocysts; inevitably deep immune suppression will have an important role in the development of true coccidiosis [32,33].

In the present study, high mixed parasitic infections (60%) were recorded, and it might be due to food preference which determines the stabilization of mixed or single infection rate of this parasite [34].

Balicka-Ramisz and Pilarczyk [35] has reported that mixed infections in domestic pigeons with intestinal *nematodes* and *coccidian* were 42%, while the research on urban pigeons of urban pigeons (*Columba livia, f. urbana*) showed that 29.9% of the birds were infected with protozoa *Ascaridia* spp. and *Capillaria* spp. [36].

4.2. The antiparasitic effects of *Artemisia herba-alba* extracts on *Capillaria* spp., and *Eimeria* spp. infected pigeons

Administration of *Artemisia herba-alba* extract to infected pigeons was shown to be associated with the reduction of oocyst output. The summary of statistical values obtained from 10 pigeons in each test group is shown in figures 2 and 3.

There was no significant difference in means of oocyst counts in all groups of *Capillaria* spp. and *Eimeria* spp. infected pigeons, after administration with 5%, 10%, 15%, and 20% aqueous extracts of *Artemisia herba-alba* compared to the oocyst count before the treatment. The few published studies on the effects of *Artemisia herba-alba* on *coccidial* infection varied greatly in results. With regard to the plant, some studies reported that this variation was probably a consequence of Artemisinin concentration caused by either different chemotypes or seasonal variation [37], although different methods of drying can increase Artemisinin concentration in leaves compared to freeze drying [38]. On the animal side, different results can be an outcome of the animal type, routes of administration, experimental design (*Eimeria* spp., oocyst dose, plant extraction methods, etc.), and different susceptibility of *Eimeria* spp. to the treatment applied [19].

5. CONCLUSIONS

The present study identified the overall prevalent parasite in the domestic pigeons (*Columba livia*) in Albeida City, Libya was *Eimeria* spp. infection with (50%) *Capillaria* spp. infection prevalence. Moreover our findings suggest that further research into the anti-parasitic effect of *Artemisia herba alba* extract in the domestic pigeons is needed.

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