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Abstract:
A total 205 quails (93 migrant; Coturnix coturnix japonica and 112 farm's quail) were collected. Fresh faecal samples were examined from each bird by direct and concentration method. The results showed that the total percentage of infection with Eimeria species oocysts was 43.90%. The prevalence of Eimeria spp. in migrant and farm's quails was 68.82% and 23.21%, respectively. Five species of the genus Eimeria were recorded in migrant quails and identified as E. bateri, E. tsunodai, E. uzura, E. coli and E. bahli and two species of Eimeria; E. bateri, E. tsunodai were found in farm's quail. Morphological characters of the detected Eimeria were described.

Key words Eimeria spp, prevalence, quails, migrant quails, farm's quail, coturnix coturnix japonica

INTRODUCTION
Quails were mid-sized birds generally considered in the order Galliformes, like; chicken, turkey and pigeons. There were two important species; The Japanese quails (Coturnix coturnix japonica) and Bobwhites quails (Colinus virginianus). The Japanese quail originated from Eastern Asia and Bobwhites were from United-State (Bahar et al., 2014). Migratory quail, known as common quail (Coturnix coturnix japonica) was one of the most migratory birds which migrates from Europe to Egypt during autumn season and act as biological and or mechanical vectors playing a role in ecology and circulation of some zoonotic pathogen threatening human health and domestic animals (Benskin et al., 2009).

Coccidiosis is a wide spread disease caused by protozoan parasites of the genus Eimeria (Coccidia: Eimerriidae), which is a complex and diverse group of protozoan parasites (Musaev et al., 1998). Over 1700 Eimeria species have been identified worldwide (Duszynski and Wilber, 1997). In Birds, pathogenic Eimeria causes enteric disease and major economic losses in the global poultry industry (McDougald and Raid, 1991). Various species of Eimeria have been isolated from the different species of quails such as E. tsunodai, E. uzura and E. bateri from Japanese quails (Teixeira et al., 2004); E. lophortygis and E. okanaganensis from California quails; E. crusti and E. oreortygis from mountain quail (Duszynski and
Gutievrez, 1981); E. conturnicis and E. bateri from grey quail (Tsutsumi, 1972); E. colini and E. lettyae from Bob white quail (Ruff, 1985) and E. tahamensis from Arabian quail (Amoudi, 1987). The present study was conducted to study the prevalence and morphological characterization of Eimeria species infecting quails.

**MATERIAL AND METHODS**

A total of 205 quails (112 farm's quail and 93 migrant quails; Coturnix coturnix japonica were collected. The farm's ones were bought from different farms at Sharkia province. Migrant quails were bought from hunters during migration season (September, October and November) from Rasheed and Damietta cities. Fresh faecal samples were collected daily from each quail which was kept in a separate wire cage and offered clean water and food. A faecal sample was taken soon after admission and examined microscopically for detection of unsporulated oocysts usind direct smear and concentration flotation method (Coles, 1974; Hoffmann, 1987 and Duszynski and Wilber, 1997).

The collected oocysts were sporulated in 2.5% potassium dichromate solution (K2Cr2 O7), mixed well and poured into petri dishes to a depth of less than 1 cm and kept at room temperature in the dark to facilitate sporulation (Duszynski and Wilber, 1997).

Sporulated oocysts were identified according to Norton and Pierce (1971), Tsutsumi (1972), Pellerdy (1974) and Teixeira et al. (2004) and photographed.

**Results**

Out of the 205 examined quails (93 migrant and 112 farm's quail), 90 cases (43.90%) were positive for Eimeria spp. The present study revealed that the prevalence of Eimeria sp was 68.82% and 23.21% in migrant and farm quails, respectively. (Table 1)

Five Eimeria species were identified in naturally infected migrant quails, namely Eimeria bateri, Eimeria tsunodai, Eimeria uzura, Eimeria colini and Eimeria bahli, while, two species (Eimeria bateri and Eimeria tsunodai) were identified in naturally infected farm's quails (Tables 2 and figures1-15).
Table (1): Prevalence of *Eimeria* species in migrant and farm quails.

<table>
<thead>
<tr>
<th>Birds</th>
<th>Migrant quails</th>
<th>Farm quails</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migrant quails</td>
<td>93</td>
<td>64</td>
<td>68.82</td>
</tr>
<tr>
<td>Farm's quails</td>
<td>112</td>
<td>26</td>
<td>23.21</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td>90</td>
<td>43.90</td>
</tr>
</tbody>
</table>

Table (2): The morphology of the oocysts of *Eimeria* spp determined in quails.

<table>
<thead>
<tr>
<th>Species</th>
<th>Oocyst size(μ)</th>
<th>Oocyst shape</th>
<th>Wall</th>
<th>Micropyle</th>
<th>Polar granule</th>
<th>Oocystic residum</th>
<th>Sporocyst shape</th>
<th>Sporocystic residum</th>
<th>Stieda body</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. bateri</em></td>
<td>20 x 14</td>
<td>Subspherical</td>
<td>Double</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>Pear</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>E. tsunodai</em></td>
<td>20.35 17</td>
<td>Ovoid</td>
<td>Double</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Ovoid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>E. uzura</em></td>
<td>18 x 13.5</td>
<td>Oval</td>
<td>Double</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>Fusiform</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>E. colini</em></td>
<td>24.15 x 20.4</td>
<td>Oval</td>
<td>Double</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>Curved fusiform</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>E. bahli</em></td>
<td>16.8 x 17.6</td>
<td>Spherical to subspherical</td>
<td>Double</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Oval</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Fig. (1-15): *Eimeria* species oocyst obtained from naturally infected quails (Migrant and farm’s quails 400x).

(1-3) *Eimeria bateri* (migrant and farm’s quails)
(1, *Eimeria bateri* non sporulated oocysts; 2&3- *Eimeria bateri* sporulated oocyst)

(4-6) *Eimeria tsunodai* (migrant and farm's quails)
(4- *Eimeria tsunodai* non sporulated oocysts; 5&6- *Eimeria tsunodai* sporulated oocyst)

(7-9) *Eimeria uzura* (migrant quails)
(7- *Eimeria uzura* non sporulated oocysts; 8&9- *Eimeria uzura* sporulated oocyst)

(10-12) *Eimeria colini* (migrant quails)
(10- *Eimeria colini* non sporulated oocysts; 11&12- *Eimeria colini* sporulated oocyst)

(13-15) *Eimeria bahli* (migrant quails)
Discussion
Quails considered a branch of the modern poultry industry. Poultry producers were looking for some substitutes of chicken meat, which in the future will come in the form of pigeon and quail meat to contribute towards the increase in gross domestic production through livestock sector (Urquhart, 1996). Several Eimeria species are highly pathogenic to their host causing great economic losses in quail breeding and limiting development of this industry (Seok et al., 2003). In the present study revealed that the prevalence of Eimeria species in quails was 43.90%. Higher prevalence rate was reported by Abedel-Aal and El-Sayed (2003) in Sharkia, Egypt who recorded that it was 62.5%. Lower prevalence rate was reported by Shakshouk et al. (1992) to be 21%. The infection rate of Eimeria species was higher in migrant quails to be 68.82% than in farm's ones infection rate (23.21%). Similar findings of higher prevalence in migrant than farm's ones were mentioned by Otify (1988b) in Egypt who found that the infection rate in migrant and farm's quails was 37.5% and 20%, respectively and Abedel-Aal and El-Sayed (2003) in Sharkia, Egypt recorded that it was 90% and 76.6%, respectively. In current study the infection rate of Eimeria species detected in migrant quails was 68.82%. This result was nearly similar with that obtained by Kucera and Reznicky (1991) in Czechoslovakia who recorded that the infection rate was 68.6%. Also, Daugschies et al. (1999) in Brazil recorded to be 68.8%. However, Ruff et al. (1985) in USA stated that the percentage of infection was 100%. Bashtar et al. (2010) in Saudi Arabia recorded that it was 80%. While, Abedel-Aal and El-Sayed (2003) in Egypt recorded the infection rate was 20% and Otify (1988b) in Egypt recorded that it was 37.5%. Moreover, Musaev et al. (1998) in Iran reported that the infection rate was 52%. Meanwhile, Mohammad (2012) in Iraq recorded that it was 49.4%.

In the present study the infection rate of Eimeria species in farm's quails was 23.21%. This result was nearly similar with that reported by Iqbal et al. (1995) in Pakistan who found that the infection rate was 28%. This result was contrary with that obtained by Abd-El-Maged (2005) in Egypt who recorded the infection rate was 31.5%. While, Abedel-Aal and El-Sayed (2003) in Egypt recorded that it was 76.6%, Badawy et al. (1999) in Egypt recorded the infection rate was 33.6%. However, Otify (1988b) in Egypt recorded that it was 90% and El-Madawy
(2001) in Egypt recorded that it was 89.8%. While, Berto et al. (2013) in Brazil recorded the infection rate was 100%. However, Roa and Sharma (1992) in India recorded that the infection rate was 16.1%.

The difference in the percentage of infection of *Eimeria* species in migrant quails may be due to the age of examined birds, which were collected randomly. Moreover, the variation in prevalence of *Eimeria* infection in farm’s quails may be due to the different system of rearing and management in quail farms.

In this study, five *Eimeria* were diagnosed in naturally infected migrant quails (*Eimeria bateri, Eimeria tsunodai, Eimeria uzura, Eimeria colini* and *Eimeria bahli*) and two species of *Eimeria* (*Eimeria bateri* and *Eimeria tsunodai*) were detected in farm’s ones. These results were nearly similar with that reported by Abedel-Aal and El-Sayed (2003) in Sharkia, Egypt who found more than six species of *Eimeria* namely; *E. bateri, E. bahli, E. uzura, E. oreortygis, E. colini, E. tsunodai* and un identified *Eimeria sp.* from common quails (*C. coturnix*). However, Abd-El-Maged (2005) in Sharkia, Egypt recorded two species of *Eimeria; E. bateri* and un identified *Eimeria sp* in farm’s quails. While, migrant ones were free from infection.

The morphology of oocysts which observed in this study was in agreement with those described by Abedel-Aal and El-Sayed (2003), Bashtar et al. (2010) and Anbarasi et al. (2016)

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الملخص العربي

معدل الانتشار والوصف الظاهرى لطفيل الأليمريا في السمـان

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تضمنت الدراسة على دراسة معدل الإصابة بالأليمريا في كل من السمان المهاجر وسـمان المزارع. لقد تم فحص مائتان وخمس من طيور السمان (112 سمان مزارع، 93 سمان مهاجر) حيث جمع سمان المزارع من مزارع مختلفة في محافظة الشرقية والـسـمان المـهاجر خلال فترة الخريف الممتدة من سبتمبر إلى نوفمبر 2017 من شواطئ رشيد ودمياط. بينت الدراسة أن معدل العام للإصابة هو 43.4% وكانت نسبة الإصابة بالأليمريا في السمان المهاجر (68.6%) أعلى من نسبة إصابتها في سمان المزارع (21.2%). وآيضا تم التعرف على خمسة أنواع من الأليمـيا في السمان المهاجر وهـم أليمـيا باترى، أليمـيا تسوندى، أليمـيا أزورى، أليمـيا كـولينـى وأليمـيا بـاتري. باهـلي بينما وجد نوعين من الأليمـيا في سمان المزارع وهـما أليمـيا بـاتري وأليمـيا تسوندى.

بالإضافة إلى وصف ظاهرى لأنواع الأليمـيا التي تم عزلها من السمان.