EFFECT OF MEDICINAL PLANTS AGAINST INTESTINAL COCCIDIOSIS AND CAPILLARIASIS INFECTING PIGEONS

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Abstract

This study evaluated the effect of garlic and black pepper against Eimeria columbae & Capillaria obsignata naturally infected 400 pigeons (Columba livia), fecal samples and crop swaps. Pigeons were divided into six groups of 10 pigeons each. G1: Control not treated. G2: Received 7 garlic cloves (9.13gm/pigeon) orally as a single dose. G3: Received black pepper kernels (0.64gm/pigeon) orally as a single dose. G4: Received orally garlic cloves (9.13gm/pigeon) and 7 black pepper kernels (0.64gm/pigeon). G5: Received Meterindazole® 250mg/liter of drinking water for three days. G6: Received a combination of 1g Amprolium® & 2g Piperazine®/liter drinking water for three days.

The results showed that E. columbae oocysts and C. obsignata eggs 2 & 5 days post-treatment significantly decreased (P< 0.05) compared to controls. Combined garlic and black pepper gave same effect as meterindazole and the other two. Stained crop smear did not show trichomoniasis.

Key words: Garlic, Black pepper, Pigeons, Eimeria columbae, Capillaria obsignata.

Introduction

Coccidiosis is one of the serious protozoan diseases of poultry caused by genus Eimeria, which usually inflict on the gastrointestinal tract leading to decrease feed intake, weight gain, feed efficiency, high mortality and decrease productivity of pigeon flock (Tanweer et al, 2014; Chand et al, 2016). Also, the gastrointestinal tract usually contained nematodes (Coppi et al, 2006), risk economic losses and welfare issues (Bould et al, 2009). Drugs resistance with side effects on animal products pave the way to alternative treatment strategies as medicinal herbs and plants (Kumar et al, 2010), in treating infectious and communicable diseases (WHO, 2014).

Garlic (Allium sativum) with alkaloids as allin, ajoene, allicin and diallylsulphide sallycysteine (Adibmoradi et al, 2006) was one of the medicinal plants with inhibitory activity against parasites, bacteria, viruses and fungi, antihypertensive, anticancer, anti-atherosclerotic, immune-stimulant, hypoglycemic and cardio-protective as well as dental and oral diseases (Abouel-Nour et al, 2016; Alali et al, 2017, Hoglund et al, 2020). Also, garlic proved effective veterinary medicines (Viegi et al, 2003; Peachey et al, 2015). Black pepper (Piper nigrum L.) is historically one of the most important spices and herbal medicines, and is now cultivated worldwide (Dosoky et al, 2019). Also, metronidazole, amprolium and piperazine are known anti-parasitic chemical drugs (Tojo and Santamarina, 1998)

This study aimed to evaluate the effect of garlic & black pepper in treating pigeons natural infected coccidiosis and capillariasis as compared with Meterindazole®, Amprolium® and Piperazine®.

Material and methods

Pigeons: Four hundred adults (C. livia), native breed weighted (200-350gm) were obtained from the Poultry Farm, Faculty of Agriculture, Assiut University. They were housed in separate well-ventilated mesh floor cages (200x100x80cm), with temperature 25 to 35°C & relative humidity 60 to 70%.

Fresh fecal samples were collected in clean labeled plastic sacks, and microscopically examined for parasites by stained direct smear and floatation methods (Garcia, 2001), Also, 400 Giemsa stained crop smears were examined for Trichomonas (Begum et al,
2008). Diagnostic stages were measured by using an eyepiece micrometer.

Treatment: Sixty naturally infected pigeons were divided into six groups of 10 pigeons each. G1: control did not receive treatment. G2: treated with garlic cloves (9.13 gm/pigeon). G3: treated with black pepper kernels (0.64 gm/pigeon), G4: treated with garlic cloves (9.13 gm/pigeon) with black pepper kernels (0.64 gm/pigeon), G5: treated with metronidazole 25 mg/liter of drinking water for three days, and G6 treated with a combined of 1 g amprolium & 2 g piperazine/liter of drinking water for three days.

The garlic and black pepper were locally purchased, and the drugs were purchased as well Veterinary Pharmacy. All of garlic cloves and black pepper were oral administering for one time as a single dose. Fecal samples were collected from pigeons in the second and five days post-treatment.

Statistical analysis: Data were analyzed by using SAS (2001) programing, version 8.2. Effect of treatments was evaluated by one-way ANOVA. Significant differences were tested by Duncan multiple range test (Steel and Torrie, 1980), significance was P<0.05. The following equation was used $Y_{ij} = \mu + T_i + E_{ij}$, Where, $Y_{ij}$ = experimental results, $\mu =$ general mean, $T_i =$ effect of treatment, where $i =$ G1, G2, G3, G4, G5 & G6, & $E_{ij}$ = errors related to individual observation

Results

The fecal samples of 400 pigeons showed that parasites were 77.8%. *Eimeria columbae* was 33% and *Capillaria obsignata* 28% & mixed infection (16.75%). *E. columbae* oocyst measured 16.25-12.5x10$^{-3}$ completed sporulation in 2 to 3 days. *C. philippinensis* eggs ovoid, with a thick shell, two polar plugs, and a single cell. Pigeons were highly emaciated, dehydrated, anemic with dead feathers and brittle. Details were given in tables (1 & 2) and figures (1, 2, 3 & 4).

Table 1: Parasites in fecal samples of pigeon

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Infected</th>
<th>Positive %</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Eimeria columbae</em></td>
<td>132</td>
<td>33%</td>
</tr>
<tr>
<td><em>Capillaria obsignata</em></td>
<td>112</td>
<td>28%</td>
</tr>
<tr>
<td>Mixed infection</td>
<td>67</td>
<td>16.75%</td>
</tr>
<tr>
<td>Total</td>
<td>311</td>
<td>77.8%</td>
</tr>
</tbody>
</table>

Table 2: Anti-parasitic effect of garlic cloves and black pepper kernels on *Eimeria columbae* and *Capillaria sp.*

<table>
<thead>
<tr>
<th>Time</th>
<th>Parasites</th>
<th>Treatment</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>G1</td>
<td>G2</td>
</tr>
<tr>
<td>Two</td>
<td><em>E. columbae</em></td>
<td>46.7±2.39</td>
<td>24.2±1.32</td>
</tr>
<tr>
<td></td>
<td><em>C. obsignata</em></td>
<td>12.7±0.74</td>
<td>7.1±0.38</td>
</tr>
<tr>
<td>Five</td>
<td><em>E. columbae</em></td>
<td>45.4±2.10</td>
<td>11.1±0.48</td>
</tr>
<tr>
<td></td>
<td><em>C. obsignata</em></td>
<td>12.0±0.62</td>
<td>2.9±0.55</td>
</tr>
</tbody>
</table>

Values in same row with different superscripts differ significantly (p<0.05).

*E. columbae* oocysts or *C. obsignata* eggs significantly decreased (P< 0.05) on second day post treatment with oral combination of garlic cloves an black pepper kernels in G4 than oral administration 3 garlic cloves alone or black pepper kernels alone in G2 & G3, respectively. Combination garlic and black pepper gave equal result as metronidazole in drinking water (G5). Adding amprolium and piperazine to drinking water (G6) was more effective (P< 0.05) compared with other treatments. After 5 days post treatment with garlic, black pepper and three drugs, *E. columbae* oocysts and/or *C. obsignata* eggs decreased significantly (P< 0.05) compared to controls. Garlic and black pepper combined with medicinal drugs significantly (P< 0.05) cured infections as compared with G2 & G3.

Discussion

In the present study, the pigeons were infected with *E. columbae* oocysts and *C. obsignata*. This agreed with Parsani and Momin (2010) in India who reported that coccidiosis and capillariasis were common in pigeons, which might be due to high abundance and resistance to common sanitizers and environmental conditions (Soulsby, 1982). Besides, the contaminated premises or soil act as a source for transmitted parasites (Islam *et al*.,
The present signs and symptoms due to *C. obsignata* and *E. columbae*, agreed with Sood et al. (2018) who found that diseased pigeons showed emaciation, ruffled feathers and diarrhea fecal droppings. In the present study, garlic and pepper given once orally to pigeons cured infection, particularly in five days post-treatment. Heckendorf (2005) found that tannin bind with to proteins on the nematode surface disturbing normal physiological functions as food absorption, mobility, or reproduction. Gaafar (2012) found that garlic increased the white blood cells, antibodies improving phagocytosis of *Eimeria* infective stages. Kim et al. (2013) reported that allicin stimulated immunity by increasing proline antibody response in *E. acervulina* in chickens to kill oocysts. Ali et al. (2019) found that ginger and garlic in little amount diminished oocyst/gm feces in *Eimeria* treated birds as compared to positive control. As to pepper, Sudhakar et al. (2013) who found that piperine 10mg/ml gave significant anthelmintic activity. Also, Thiengsusuk et al. (2018) reported that piperine exposure gave marked change in *P. falciparum* clone within 48hrs.

Generally, garlic bulb phytochemical alkaloids contain terpenoids, flavonoids, steroid, phenol, tannin, anthraquinones, saponin, and cardiac glycosides (Bin et al, 2020). Piperine, an active pepper ingredient contains photochemistry as volatile oil, oleoresins, and alkaloids immuno-modulatory, antioxidant, anti-asthmatic, anti-amoebic, anti-carcinogenic, anti-ulcer and anti-inflammatory activities (Meghwal and Goswami, 2013). Strong activity of these alkaloids active body immune system, and strengthens defense mechanism (Masamha, 2010).

**Conclusion**

Oral administrated of garlic (9.13gm/bird) and black pepper kernels (0.64gm/pigeons) with or without metronidazole, amprolium and piperazine combination were effective for treating *Eimeria columbae* and *Capillaria obsignata* adult pigeons.

**References**


Gracia, LS. 2001: Diagnostic Medical Parasitology. ASM Press; Washington, DC.


Explanation of figures

Fig.1: Usporulated Eimeria columbae oocyst x100
Fig.2: Sporulated Eimeria columbae oocyst x100
Fig.3: immature egg Capillaria sp. X40
Fig.4: Parasitic diseased pigeon