Effect of four fruit extracts on Rhode Island Red poultry chicks infected with *Eimeria tenella*

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Abstract
Four fruits, *Aegle marmelos*, *Syzygium cumini*, *Punica granatum* and *Carica papaya*, were selected to investigate the effect of their extracts on the performance of Rhode Island Red poultry chicks experimentally infected with *Eimeria tenella*, a highly pathogenic *Eimeria* species that causes caecal coccidiosis. Thirty one-day-old coccidia-free Rhode Island Red chicks (45 ± 3.5 g) were divided into five groups and reared in cage. Four groups were treated with extracts of *Aegle marmelos*, *Syzygium cumini*, *Punica granatum* and *Carica papaya* fruits extract @ 1 ml bird⁻¹ day⁻¹ from 7 day age and remaining one group served as control received no treatment. All groups were challenged with *E. tenella* @ 10⁶ oocyst bird⁻¹ at the age of 14 days. Throughout the experimental period from day 1 to day 22, oocyst output, pathological and performance parameters including growth, mortality, feed and water intake, feed conversion index, caecal lesion score and bloody diarrhoea were recorded at regular interval. Oocyst count was 43 to 50% and 51 to 56% lower in *Punica granatum* and *Carica papaya*, respectively than that of the rest two treatments (*Aegle marmelos* and *Syzygium cumini*). Increased growth, feed and water intake, and feed conversion index were found in *Punica granatum* and *Carica papaya* treatment groups than that of the *Aegle marmelos* and *Syzygium cumini* treated groups. The caecal lesion and bloody diarrhoea score was lower in the birds of *Punica granatum* and *Carica papaya* treatment groups, whereas remaining two treatments (*Aegle marmelos* and *Syzygium cumini*) groups showed 4 score of caecal lesion. It, therefore, can be concluded that there might be a response of *Punica granatum* and *Carica papaya* fruits extract to reduce the severity of infection to chickens by exerting a coccidiostatic effect against *E. tenella*.

Keywords
Chickens; fruit extracts; *Eimeria tenella*; coccidiosis; performance

Introduction
Coccidiosis is one of the most detrimental disease in poultry industry caused by pathogenic protozoa *Eimeria*, is usually located in caecum of chicken and leading to cecal coccidiosis (Augustine, 2001; Allen et al., 1998). Impaired feed conversion, retarded
growth rate and development, diminution of their body masses, diarrhea, dehydration, and death in young animals are manifesting symptoms of this disease (Levine, 1985; Mc Dougald, 1998). Endogenous stages of the parasites and a high number of oocysts in feces were associated with intestinal lesions (Teixeira et al., 2004). The economic loss is made up of the mortality and deterioration of the meat quality (Musaev et al., 1977). Chickens are continuously vaccinated and medicated with a number of coccidiostatic drugs and predominately ionophore antibiotics through feed to overcome the potential for coccidiosis outbreak and resulting tremendous financial loss of farmer. However, concern has been expressed regarding the profuse and routine use of these vaccines and drugs and antibiotics in feeds due mainly to the emergence of resistant coccidial strains (Chapman, 1986). Moreover, these practices unfortunately contaminate the environment that enhancing the rate of pollution from environmental point of view. In this respect, the use of hazardous antibiotic feed additives in general is being phased out in many countries and only a few coccidiostatic drugs remain as nonprescription feed additives (European Commission Regulations, 1997). Such, if all coccidiostatic feed additives are restricted from use in coccidiosis controlling measure, alternative feeding strategies should probably be introduced to combat the adverse effects of coccidia on chicken production. Therefore, an intensive research is needed for the identification and evaluation of alternatives to traditional coccidiostatics that would be easily available and low cost devise to satisfy consumer demands and would be eco-friendly farming practices using the local natural plant resources.

Few natural products have already been examined for their potential to provide protection against or modulate the effects of coccidial infections. It has been reported that dried leaves of Artemisia annua could provide significant protection against intestinal lesions caused by E. tenella (Allen et al., 1997). Youn & Noh (2001) found that Sophora flavescens extracts were more effective than Artemisia annua against E. tenella infection in chickens. Giannenas et al. (2003) reported that the essential oil of oregano, an aromatic plant of the Labiatae family, exhibited coccidiostatic action against E. tenella when incorporated into chicken diets at the level of 300 mg kg⁻¹.

From the above points of view, the present study has been aimed to investigate the effect of fruits extracts on the performance of Rhode Island Red poultry chicks experimentally infected with Eimeria tenella, a highly pathogenic Eimeria species that causes caecal coccidiosis.

**Materials and methods**

*Birds and housing*

Thirty one-day-old coccidia-free Rhode Island Red chicks (45 ± 3.5 g) were collected from a local poultry farm, reared for one week in a standard poultry cages for acclimatization, providing proper environmental conditions (stress free) and given non-medicated feed and water. After one week of rearing the birds were randomly distributed into five equal groups of six birds. Each group was housed in separate wire suspended cage (2.5 ft²) equipped with all suitable facilities.